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MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES, POLLUTION ABATEMENT, PUBLIC HEALTH. SATILLA-ST. MARYS BASIN

Public Health Service
Atlanta, Georgia

June 1962

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TECHNICAL MEMORANDA FOR WATER SUPPLIES POLLUTION ABATEMENT AND PUBLIC HEALTH

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PREPARED FOR
UNITED STATES STUDY COMMISSION, SOUTHEAST RIVER BASINS
BY
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, REGION IV
WATER SUPPLY & POLLUTION CONTROL PROGRAM
ATLANTA, GEORGIA
JUNE 1962

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UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service, Region IV

Water Supply and Pollution Control Program

Technical Memoranda

for

Municipal, Industrial and Domestic Water Supplies
Pollution Abatement
Public Health

SATILLA-ST. MARYS BASIN

Prepared for

United States Study Commission,
Southeast River Basins
Atlanta, Georgia
June 1962

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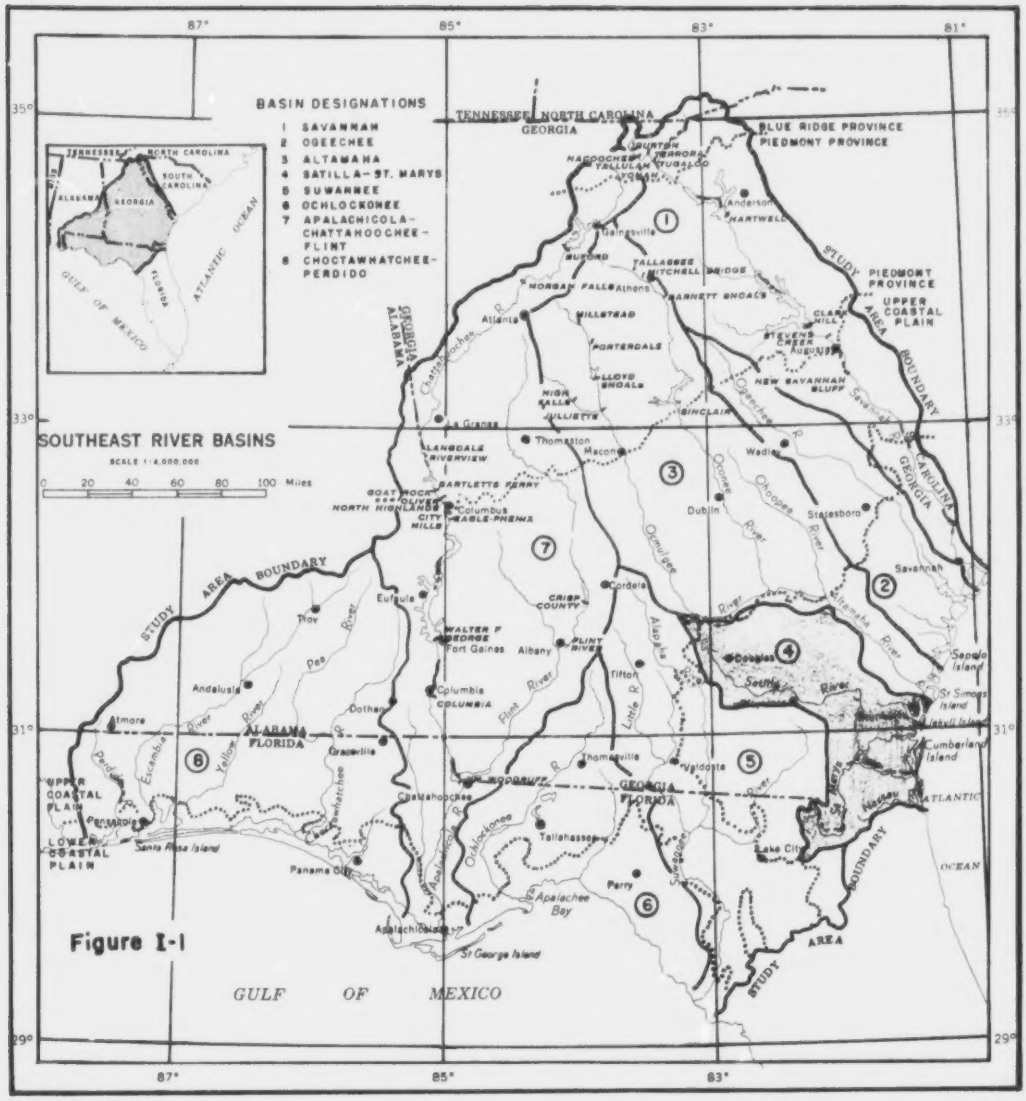
INTRODUCTION



U. S. Study Commission, Southeast River Basins
P. O. Box 953, Atlanta 1, Georgia

PREFACE

SCOPE

The U. S. Study Commission, Southeast River Basins, on December 30, 1959 and March 11, 1960, requested the assistance of the Public Health Service in:

(1) Formulating a domestic, municipal, and industrial water supply plan, including pertinent economic studies,

(2) Formulating a water quality management plan including water pollution abatement and pertinent economic studies, and

(3) Formulating a plan for the protection of public health related to plans for the conservation, utilization, and development of land and water resources of the study area.

The Study Commission proposed that the Public Health Service compile the required basic data and prepare "single-purpose technical memoranda" on each of the above subjects and that these technical memoranda set forth the requirements for development to serve the above functions at present, in 1975, and 2000 in each of the eight river basins of the study area.

These memoranda on the Satilla-St. Marys Basin have been prepared in fulfillment of the Commission's requests. They have been divided into three separate memoranda: MUNICIPAL, INDUSTRIAL, AND DOMESTIC WATER SUPPLIES; POLLUTION ABATEMENT; and PUBLIC HEALTH. In addition, a separate report has been prepared by the Public Health Service for the U. S. Study Commission: Water Quality Basic Data - Southeast River Basins, dated 1961. This report covers the Satilla-St. Marys Basin as well as the seven other Basins within the U. S. Study Commission study area.

The purpose of these memoranda is to provide data and information to the U. S. Study Commission - SERB on the present and projected status of water supply, pollution abatement, and public health facilities and programs for use in the preparation of a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Satilla-St. Marys Basin.

AUTHORITY

The Study Commission's requests are in partial fulfillment of its obligation under Public Law 85-850 which states in part: "In carrying out the purpose of this Act it shall be the policy

of Congress to utilize the services, studies, surveys, and continuing investigational programs of the departments, bureaus, and agencies of the United States". The Act also states that the Commission may "secure directly from any executive department, bureau, agency, commission, office, independent establishment, or instrumentality, information, suggestions, estimates, and statistics for the purpose of this Act, and each such department, bureau, agency, board, commission, office establishment, or instrumentality is authorized to furnish such information, suggestions, estimates and statistics directly to the Commission, upon request by the Chairman or Vice Chairman".

The authority for the Public Health Service to undertake this study and the preparation and submission of these technical memoranda stems from the above and from the Public Health Service Act of 1944 (Public Law 410, 78th Congress) and its amendments; the Federal Water Pollution Control Act (Public Law 660, 84th Congress), and its amendments; Federal legislation on air pollution (Public Law 159, 84th Congress), with amendments; related miscellaneous provisions of other statutes; and the Public Health Service Regulations.

Public Law 85-850, under which the U. S. Study Commission operates, provides for investigations and studies and the preparation of a comprehensive and coordinated plan for the conservation, utilization, and development of land and water resources in the study area. In this plan formulation, the law specified, among other things, the inclusion of plans for:

(1) domestic and municipal supplies;

(2) possibilities of industrial development and utilization;

(3) pollution abatement and the protection of public health; and

(4) other beneficial and useful purposes.

ECONOMIC BASIS FOR PLANNING

Projections for 1975 and 2000 in this report were made using estimates of economic development furnished to the Public Health Service by the U. S. Study Commission, Southeast River Basins. The pattern of the future economy stems mainly from projections of population, employment, and income furnished by the Commission. The basic aggregate projections for these three components are considered by the Commission to be relatively firm. The breakdown of the basic projections into their different components and the derivation of data for river basins is based, in some cases, on limited information. The Commission emphasizes that these are preliminary estimates and that the pattern of the projected economy should not be taken as a rigid goal but should be considered flexible and subject to modification and refinement as the results of future studies become available.

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RESPONSIBILITIES

The basic responsibility for the administration of Federal programs in municipal water supply, pollution control, and public health is vested in the Public Health Service. State programs and responsibilities are administered by the State health departments and water pollution control agencies. In the administration of these Federal and State programs, cooperation and assistance of other agencies with interests in these fields are obtained. The responsibilities and interests of all Federal, State, and local agencies in municipal water supply pollution control and public health programs in the Satilla-St. Marys Basin are enumerated below.

PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

The Public Health Service serves in a consulting capacity to other Federal agencies and to the State and local health departments on matters relating to water supply, water pollution control, vector control, and other matters related to public health; makes investigations and studies; does scientific research in the above fields; collects vital statistics; and operates certain medical care and quarantine programs. In protecting the public health, the Service is responsible for developing and recommending procedures for the prevention and control of mosquitoes and other vectors associated with Federal water development projects.

As part of its responsibilities under the Federal Water Pollution Control Act (Public Law 660, 84th Congress) as amended, the Service is required to prepare or develop in cooperation with other Federal agencies, State and interstate water pollution control agencies, municipalities and industries, comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary conditions of surface and underground waters. In the development of such comprehensive programs, due regard is given to the improvements which are necessary to conserve such waters for public water supplies; propagation of fish and aquatic life and wildlife; recreational purposes; and agricultural, industrial, and other legitimate uses. The Service is further authorized to advise any Federal construction agency concerning the inclusion of storage in any proposed reservoir for regulations of stream flow for the purpose of water quality control.

The Public Health Service is authorized to make joint investigations, with any such agencies, of the condition of any waters in any State or States, and of the discharge of any sewage, industrial wastes, or substance which may adversely affect such waters. Section 8 (a) of Public Law 660 states that "The pollution of interstate or navigable waters in or adjacent to any State or States

(whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters), which endangers the health or welfare of any persons shall be subject to abatement as provided in this Act."

The Public Health Service works closely with State agencies and makes investigations and studies relating to health and pollution control aspects of development programs pertaining to municipal, industrial, and domestic water supplies. The Service also has the responsibility of collecting and disseminating basic data on radiological, chemical, physical, and biological water quality and other information insofar as such data and information relate to water pollution and the prevention and control thereof.

CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

The Corps of Engineers operates the Federal program for the improvement and maintenance of rivers and other waterways in the interest of navigation and flood control. Water conservation and other water use functions beneficial to the public are considered in carrying out investigations and construction of water projects. Health matters relating to these projects include vector control, sanitation of work camps, recreation, water supplies, and water pollution abatement.

SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE

The Soil Conservation Service, under Public Law 566, 83rd Congress, as amended, prepares watershed work plans for small watersheds to assure water-flow retardation and soil erosion prevention. In the development of these work plans, consideration is given to water use functions beneficial to the people of the area, including irrigation, stock watering, and fish and wildlife propagation and municipal and industrial water supply. Control of insects around the watershed and use of water for domestic purposes are also given consideration.

FOREST SERVICE, DEPARTMENT OF AGRICULTURE

The Forest Service is responsible for the development and management of National Forests to preserve and increase the multiple benefits from these natural resources. Good forest management retards rapid runoff and prevents soil erosion, thus reducing pollution from natural sources. Sanitation of public facilities in National Forests is under the supervision of the Forest Service and privately operated facilities are regulated by use permits issued by the Service. It is to be noted, however, that Section 480, Title 16, U. S. Code states that jurisdiction over persons within National Forests should not be affected by the reason of these forests' existence. Thus, health and sanitation in National Forests is of concern to State and local health authorities.

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GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

The Geological Survey is primarily a fact-finding and research agency. It collects, analyzes, and interprets basic data on water, mineral, and land resources, and prepares topographic and geological maps and reports as a prerequisite to planning, constructing, and operating projects for the development and utilization of these natural resources.

NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR

The National Park Service administers programs for the National Parks, monuments, historic sites, and similar areas. It has the responsibility for maintaining sanitary and healthful conditions in these areas. The Service cooperates with other agencies in investigating the recreational possibilities at proposed reservoir projects and in planning for their protection, development, and utilization.

ATOMIC ENERGY COMMISSION

The Atomic Energy Act of 1954 authorizes the Atomic Energy Commission to regulate the use of certain radioactive materials and certain facilities, which produce or use these materials, to protect against hazards to life or property. A National Committee on Radiation Protection, comprised of members of several Federal agencies including the Public Health Service and professional organizations, prepares recommendations on protection from radioactive substances.

FLORIDA STATE BOARD OF HEALTH

Rules and regulations for the betterment and protection of the public health of the State of Florida are included in the State's Sanitary Code (Chapter 381, Florida Statutes). The adoption, promulgation, and enforcement of this Code is the responsibility of the Florida State Board of Health. Among the 35 chapters of the Sanitary Code relating to the public health engineering and sanitation program of the State, there are included rules and regulations governing public water supplies, public sewerage systems, pollution of streams and waters, swimming pools and bathing beaches, impoundments, and private water supply wells.

Other statutes which are administered by the State Board of Health are the Tourist Camp Law (Chapter 513, Florida Statutes); The Nuisance Law (Chapter 386, Florida Statutes); Supervision by the State Board of Health ver Pollution of All Underground and Surface Waters in the State and Over Water Supplies, Sewerage

Systems, Sewage Waste and Refuse Disposal Systems in the State (Chapter 381 and Chapter 387, Florida Statutes); Pollution of Waters (Chapter 387 Florida Statutes); the Swimming Pool Law (Chapter 514, Florida Statutes); and the Air Pollution Control Act (Chapter 403, Florida Statutes 1957).

The Board has the authority to issue permits and review plans and specifications for the installation, alteration or extension of a water supply or sewerage system, and refuse or sewage disposal facilities to serve more than 25 people. The Board is further authorized to enforce any provisions of the Sanitary Code; conduct experiments relating to the purification of water and treatment of sewage, waste or refuse; consult with and advise counties, municipalities and other persons as to source of water supply, methods of water purification, and disposal of drainage sewage or refuse; to establish water purity standards for the streams of the State; and to control air pollution in accordance with rules and regulations adopted by the State Air Pollution Control Commission.

LOCAL HEALTH DEPARTMENTS (FLORIDA)

In Florida, local health departments are organized on a county, multicounty, or city-county basis. Health officers in charge of these local units are deputized agents of the State Health Officer for the purpose of carrying out the provisions of the Sanitary Code of the State. Local health departments have the power to enforce rules, regulations, orders, and ordinances regarding the public health in accordance with the State laws. Local health departments also have the power to make sanitary inspections and isolate, quarantine, and abate nuisances.

FLORIDA BOARD OF CONSERVATION

The State Board of Conservation, through its Department of Water Resources, advises the Florida State Cabinet on measures to conserve and promote wider use of water resources; advises and coordinates the efforts of local agencies, water control authorities, municipalities, counties, and individuals to achieve improved conservation, control, and use; and conducts an educational program to inform the public of sound State water resource policies and procedures.

FLORIDA GAME AND FRESH WATER FISH COMMISSION

The State Game and Fresh Water Fish Commission collects and compiles data of a biological and economic nature and recommends measures to mitigate losses or increases in the value of various water control structures to wildlife. The Commission also represents fish and wildlife interests in the planning of water resource projects.

FLORIDA GEOLOGICAL SURVEY

This agency collects and compiles basic hydrological data on water resources of the State; locates uncontrolled flowing artesian wells and

through the Water Resources Department cooperates with the U. S. Geological Survey on water surveys.

GEORGIA DEPARTMENT OF PUBLIC HEALTH

The State has retained all responsibilities and duties for the health of the public not otherwise granted to the Federal government in the Federal Constitution or by Acts of Congress. The State operates under the police power, inherent in the soverign State to enact and enforce laws to protect and promote the health, safety, morals, order, peace, comfort, and general welfare of the people. Among the powers of the State Board of Health are the following:

1. Adopt rules, regulations, and orders.

2. Enforce State laws, regulations, and orders.

3. Isolate and quarantine, make sanitary investigations and inspections, and collect vital statistics.

4. Review plans and specifications for any new municipal water systems to be installed, or changes to be made in any existing system by any city, corporation, partnership, or individual.

5. Inspect the source of municipal water supply, and to determine if the water is impure and dangerous to individuals or to the public generally.

6. Act in a consultative capacity to local agencies.

7. Approve and regulate the impounding of waters as they affect insect and vector control.

The Georgia Water Quality Act (Laws of Georgia, 1957, Act No. 491) provides for the control of water quality within the State and the regulation of public water supply treatment facilities. It prohibits the discharge of sewage, industrial wastes, or other wastes into the waters of the State which would adversely affect the health of the people or render such waters unsuitable for their then current uses, and provides for the treatment of such wastes. It provides for the issuance of certificates to persons discharging or permitting to be discharged into the waters of the State any sewage, industrial wastes, or other wastes.

The Act declares it to be the policy of the State of Georgia that the water resources of the State shall be utilized prudently to the maximum benefit of the people without so impairing the quality of the water resources as to jeopardize public water supplies and

public health, and without interfering unreasonably with beneficial use of the water resources for recreation, fish and wildlife development, agriculture, and the industrial development of the State's natural resources and its manpower. The State water pollution control agency (State Board of Health) is charged with the responsibility, and has the authority to require the use of reasonable methods to prevent and control the pollution of the waters of the State.

The State Board of Health under the Water Quality Act, has the responsibility and power to, as it deems necessary, establish such standards of quality for any waters in relation to the reasonably and proper use thereof, and such general policies and standards relating to any existing or future pollution of such waters. The State Board of Health has the power to issue orders directing any particular person or persons to secure within the time specified therein, such operating results as are reasonable and practicable of attainment toward the control, abatement, and prevention of pollution of the waters of the State and the preservation of the necessary quality for the reasonable use thereof.

The State Board of Health has the power to establish such policies, requirements, and/or standards governing the source, distribution, purification, treatment and storage of water for public or community water supply systems as it deems necessary for the reasonable and proper use thereof in conformity with the intent of the Water Quality Act. The Act states that it shall be unlawful for any person to erect, construct, enlarge, extend, open, reopen, or operate any public or community water supply system including storage, distribution, purification treatment facilities or works, without having first secured from the Board approval of the source of water supply; the means and methods of treating, purifying and storing water; plans and specifications for the construction of facilities or works; and the operation thereof.

LOCAL HEALTH DEPARTMENTS (GEORGIA)

Georgia laws provide for the formation of county boards of health. These are created for the purpose of carrying out State rules, regulations, and orders as well as adopting other regulatory measures needed for protecting the public health within the local jurisdiction. Local Boards of Health in Georgia have the power to:

1. Adopt rules, regulations, and orders.

2. Enforce State laws, regulations, and orders.

3. Enforce local regulations and ordinances.

4. Make sanitary inspections and investigations, isolate, quarantine, and abate nuisances.

GEORGIA OIL AND GAS COMMISSION

The Georgia Oil and Gas Commission is authorized to make rules, regulations, and orders for the prevention of the pollution of fresh water supplies by oil, gas or salt water (1955 Cum. Supp., Title 43, Section 713).

GEORGIA GAME AND FISH COMMISSION

In the protection of fish and other aquatic life, the Georgia Game and Fish Commission is vitally interested in habitat waters. This agency cooperates with other State and Federal agencies in investigations and studies of water quality as related to fish and other aquatic life. This Agency enforces legislation against the use of explosives, poisonous substances, etc. for the purpose of catching, killing, taking or harming fish (1955 Cum. Supp., Title 45, Section 703).

GEORGIA WATER QUALITY COUNCIL

The Georgia Water Quality Council makes recommendations to the State Board of Health with regard to regulations, procedures, standards, waste disposal certificates, and policies governing public and community water supplies and waste disposal into waters of the State for controlling pollution and quality of such waters.

GEORGIA DEPARTMENT OF MINES, MINING, AND GEOLOGY

The Division of Conservation in this Department collects and compiles water resources data and cooperates with the U. S. Geological Survey, U. S. Soil Conservation Service, and State Soil Conservation Committee on surface and ground water surveys and chemical quality of waters.

GEORGIA RESOURCES COMMISSION

The Commission is responsible for inventorying the State's water resources and gathering such data as are necessary for determing what further legislation is needed with regard to quantitative control of the State's water resources. A State water engineer, appointed by the Commission is authorized to employ a water resources fact finding and research staff to be known as the Georgia State Water Survey.

WATER PURVEYORS

The general responsibility for the purity of water is shared by health authorities, water purveyors, owners of property, and water users. Those duties of health authorities and other agencies have been presented. The purveyor of water must safeguard it while in the water supply system, with some overlapping responsibilities with the property owner once the water reaches the property line.

(6/15/62)

Regulations controlling the manufacturing, importing or bottling of water in the Basin are administered by the Florida and Georgia State Boards of Health.

DESCRIPTION OF THE BASIN

GENERAL

The Satilla-St. Marys Basin is bounded on the north by the Altamaha Basin, on the east by the Atlantic Ocean, on the south by the St. Johns Basin, and on the west by the Suwannee Basin.

Most of the Satilla-St. Marys Basin is in the Lower Coastal Plain Province except for 71 square miles in the northwestern tip and has a drainage area of 5,520 square miles. The Basin is nearly flat and has many low, wet lands, and marshes. Nearly fourth-fifths of the area has woodland cover, predominately pine forests, with some bottomland hardwood. The rivers of the Basin carry a relatively light sediment load, although poorly drained areas contribute much solid and dissolved organic matter which causes the typical dark color of the surface waters.

The Satilla River rises in Ben Hill and Coffee Counties, in south-central Georgia, at an elevation of about 350 feet and flows generally southeasterly for 260 miles to the Atlantic Ocean at St. Andrews Sound. The St. Marys River rises along the southeastern edge of the Okefenokee Swamp at an elevation of about 120 feet and flows south from the Swamp, turns north then east and empties into the Atlantic Ocean near Fernandina Beach, Florida. From its source in the Okefenokee Swamp, the St. Marys River forms the boundary between Georgia and Florida. The Satilla-St. Marys Basin also includes the Nassau River drainage area which consists of 400 square miles of low-lying coastal land south of the St. Marys Sub-basin.

Tidal effects extend up the rivers of the Basin for approximately 60 miles. There are no major storage reservoir, diversions, hydroelectric plants, or other water resource projects in the Basin. The large number of small impoundments, lakes, and farm ponds have little effect on stream flows.

CLIMATE AND HYDROLOGY

The climate of the Basin is temperate with long, warm summers and short mild winters. The mean annual temperature is 68°F. The frost free growing season ranges from about 250 days near Douglas, Georgia to 300 days along the coast and much of the rainfall occurs during the growing season. The average annual rainfall ranges from 44 inches in the interior to 52 inches near the coast.

The 28-year record (1930-58) of the Satilla River at Atkinson, Georgia where the drainage area is 2790 square miles, shows a 24-hour

maximum discharge of 110,000 cfs, a minimum discharge of 25 cfs and an average discharge of 1,932 cfs. There are no major tributaries entering the river below this gaging station which is located some 80 miles above the mouth. The 32-year record (1927-58) for the St. Marys River at Macclenny, Florida, where the drainage area is 720 square miles, shows a 24-hour maximum discharge of 28,100 cfs, a minimum of 12 cfs and an average discharge of 635 cfs. This gaging station is located one mile below the junction of the north and south prongs of the St. Marys River and about 100 miles above the mouth.

The Basin lies almost entirely in the Lower Coastal Plain Province which is underlain by the principal limestone aquifer. This aquifer is composed of the Ocala limestone of late Eocene age, the Suwannee limestone of Olegocene age, and the Tampa limestone of Miocene age which generally acts as a single hydrologic unit. The upper confining bed of low permeability is the Hawthorne formation and the lower confining bed consists of clay and limestone of the McBean formation. Wells in the principal limestone aquifer yield several thousand gallons per minute. Most common well depths are 600-900 feet. Well defined cones of depression in the aquifer exist at Brunswick and St. Marys, Georgia and Fernandina Beach, Florida. There are no known areas of recharge of this aquifer located within the Basin.

In the upper portion of the Basin, above Waycross, Georgia municipal ground water supplies are obtained from the limestone and sand aquifers of the early Tertiary age. The three main rock groups which make up these aquifers are the Midway, Wilcox and Clairborne groups. Each of these groups are divided into one or more formations, some of which are artesian aquifers, others the confining beds. In the lower portion of the Basin, below Waycross, municipal ground water supplies are obtained from the sand and limestone aquifers of the Miocene age. Some older wells, less than 200 feet deep, obtain water from the aquifers of the Pliocene age but these are limited in number and capacity. Most ground water supplies in the Satilla-St. Marys Basin are obtained from the aquifers of the Miocene age.

POPULATION

The population of the Satilla-St. Marys Basin according to census data provided by the U. S. Study Commission, was 165,500 in 1960. This represents an increase of 15,500 or 10.3 percent over the 150,000 reported by the 1950 census. The urban population (municipalities of 2500 or more) increased 42.5 percent during the 1950-60 decade while the rural population decreased 10.4 percent.

There are nine communities in the Basin which have populations greater than 2500. These are: Fernandina Beach, 7276; and Macclenny, 2671; in Florida; and, Alma, 3515; Baxley, 4268; Brunswick, 21,703; Douglas, 8736; St. Marys, 3272; St. Simons, 3199; and Waycross, 20,944 in Georgia.

(6/15/62)

RESOURCES

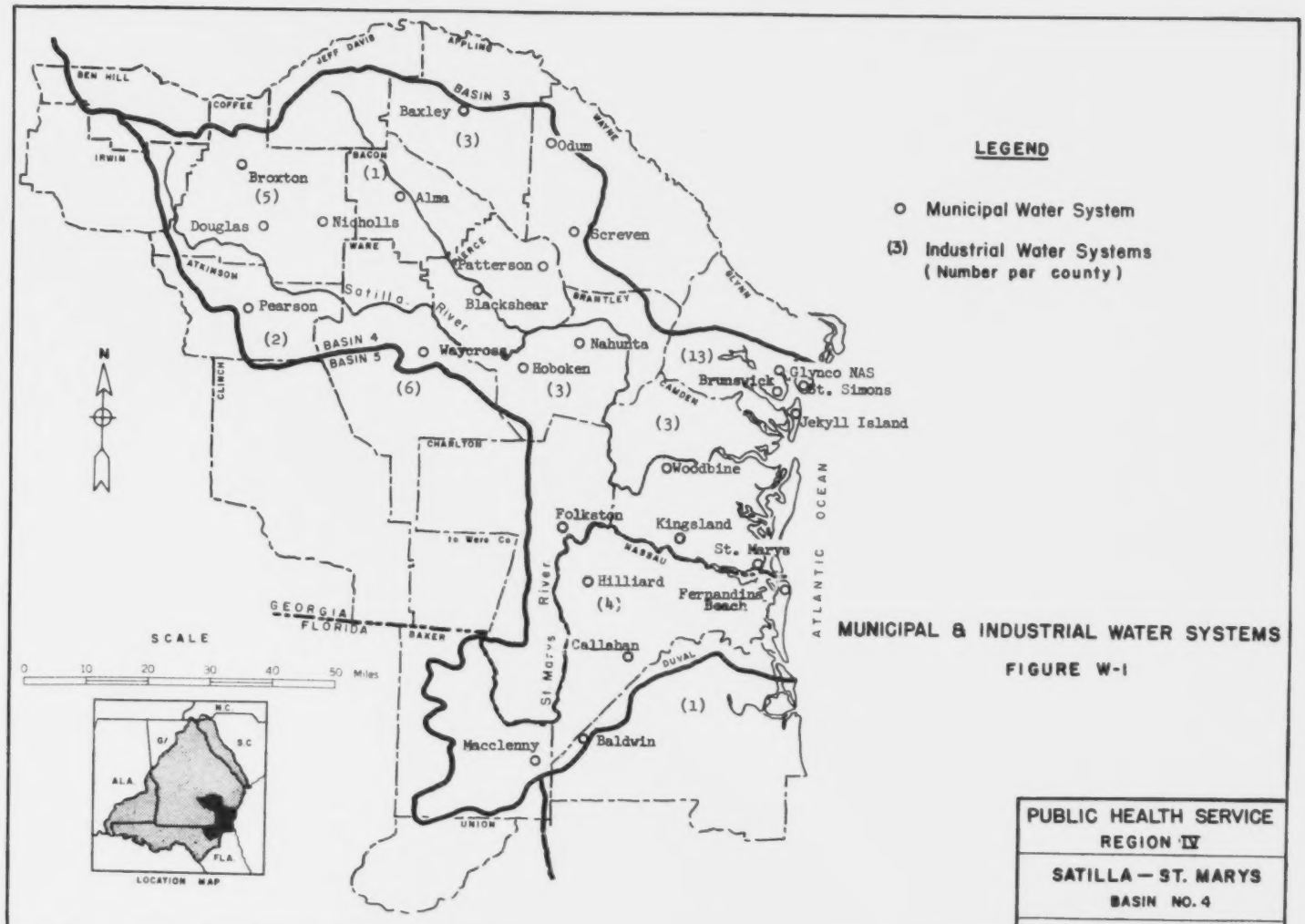
The economy of the Basin is one of combined agriculture and industry with a slightly larger number of persons engaged in manufacturing than in farming. The land resources are used principally for forestry and agriculture. Leading income crops are forestry products, corn, cotton, tobacco, peanuts and commercial truck-crops.

The manufacture of pulp and paper products is the chief industry of the Basin. About 3800 persons are employed by pulp and paper plants in Brunswick, St. Marys, and Fernandina Beach. Approximately 250 other manufacturing and processing plants in the Basin are engaged in food processing, lumber and wood products, chemicals, and metals manufacturing. Commercial off-shore fishing and seafood processing are also important industries at Brunswick, St. Marys and Fernandina Beach.

Navigation on the Basin's rivers is limited to small craft except on the lower reaches. The Atlantic Intracoastal Waterway which passes through the eastern edge of the Basin and the three deep-draft ports are important navigation facilities. Commerce at Brunswick, and Kings Bay Terminal in Georgia, and Fernandina Beach in Florida includes both barge and deep-draft traffic.

Recreational uses of the waters of the Basin are extensive and include fresh and salt water fishing, hunting, boating and swimming in salt water areas. Beaches have been developed at St. Simons Island, Sea Island, and Jekyll Island in Georgia and at Fernandina Beach in Florida.

MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES


BEN HILL
JEFF DAVIS
APPLING
COFFEE
BASIN 3
WAYNE
IRWIN
BACON
Baxley
(3)
Odum
Broxton
(5)
(1)
Alma
Douglas
Nicholls
Screven
WARE
PIERCE
Patterson
ATKINSON
Satilla River
Blackshear
BRANTLEY
BRYAN
Pearson
(2)
BASIN 4
BASIN 5
Waycross
Nahunta
Hoboken
(3)
(13)
Glynco NAS
Brunswick
St. Simons
CAMDEN
(6)
CLINCH
(3)
Jekyll Island
CHARLTON
Woodbine
Folkston
Kingsland
ATLANTIC OCEAN
to Ware Co.
St. Marys
NASSAU
Hilliard
(4)
Fernandina Beach
St Marys River
GEORGIA
FLORIDA
BAKER
Callahan
DUVAL
(1)
Macclenny
Baldwin
UNION
N
SCALE
0 10 20 30 40 50 Miles
N.C.
S.C.
GA.
ALA.
FLA.
LOCATION MAP
LEGEND
Municipal Water System
(3) Industrial Water Systems
(Number per county)
MUNICIPAL & INDUSTRIAL WATER SYSTEMS
FIGURE W-1
PUBLIC HEALTH SERVICE
REGION IV
SATILLA — ST. MARYS
BASIN NO. 4
JANUARY 1, 1960

W-1-a

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal, industrial, and domestic water supply systems whose source of water is in the Satilla-St. Marys Basin. Although an attempt was made to collect data on semi-public water supplies, the amount of information available was not sufficient to warrant inclusion in this memorandum. Estimated future water requirements in the Basin for the years 1975 and 2000 are also presented, as are suggested solutions to present and anticipated future water supply inadequacies. In connection with these suggested solutions, an appraisal of the benefits to be derived and the annual costs of obtaining water are included.

This memorandum contains no data concerning water requirements of steam-electric generating stations located in the Basin.

PROCEDURES AND INVESTIGATIONS

Existing data on water demand and availability were obtained from reports, records, and correspondence of the Florida State Board of Health, the Florida State Chamber of Commerce, the Georgia Department of Public Health, the Georgia State Chamber of Commerce, the Georgia Department of Commerce, the U.S. Department of Agriculture, and other Federal and State agencies. Where data were found to be lacking or out-dated, extensive field investigations were conducted. These field investigations were conducted by the Florida State Board of Health and the Georgia Department of Public Health. The data obtained were submitted to the Public Health Service for inclusion in this memorandum. The field investigations included visits to municipalities, small communities, industries, institutions, and a limited number of domestic water users.

Data were obtained regarding the 32 municipal water supply systems in the Basin and carefully studied to establish both present and future water requirements and water supply needs. Data on industrial water use were obtained from the municipalities furnishing the water, or when an industrially-owned water supply system was involved, from the industry itself. The location of municipal and industrial water supply systems is shown by Figure W-1.

Little information was available concerning the large number of existing domestic water supply systems. Because limited time and funds would not permit a complete inventory of all domestic water systems, a random sample survey of approximately 500 systems throughout the Southeast River Basins, (SERB) area was made. The data thus obtained were analyzed and certain conclusions were drawn

regarding the average number of persons served by each system, the percentages of the various types of wells and equipment, and the extent of improvements needed. These SERB area averages were applied to the Satilla-St. Marys Basin.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for communities not listed in census reports. Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960 modified by consideration of changing economic conditions. However, the population projections of urban areas (municipalities of 2,500 or more) were adjusted to match projections made by the U.S. Study Commission.

For purposes of this memorandum, future municipal water demands were determined using projected urbanized area populations and estimated per capita water use. The 1975 needs were determined using a water demand of 100 gallons per capita per day (gpcd) in municipalities of under 1,000 persons and 150 gpcd in municipalities of 1,000 or more. The 2000 projections were based on a water demand of 150 gpcd in municipalities of less than 1,000 persons and 200 gpcd in municipalities of 1,000 or more.

The number of domestic water users was estimated for 1960, 1975, and 2000. This number was determined by obtaining the difference between the population within the Basin served by municipal water systems and the total population of the Basin. Future domestic water demand was estimated by using 70 gpcd in 1975 and 100 gpcd for 2000. A figure of 4.5 persons per system was used to determine the number of domestic water supply systems. All future systems were assumed to be pressurized.

Projections of industrial water system demands (for those industries receiving all or a portion of their supply from industrially-owned systems) were determined by assuming that water demands will increase or decrease in direct proportion to projected industrial growth or decline. In addition two new industries are expected to locate in the Basin.

January 1, 1960 constant dollars were used for the purpose of estimating annual capital costs, annual operation and maintenance costs, and annual replacement costs of existing and needed water supply systems. An interest rate of 4½ percent was used for determining annual costs for municipal, domestic, and industrial water supply systems.

Water supply system costs have been estimated on the basis of per capita cost data developed by the Public Health Service and adjusted to the January 1, 1960 Engineering News-Record Construction

Cost Index for Atlanta, Georgia.

QUANTITY AND QUALITY OF WATER AVAILABLE FOR WATER SUPPLIES

SURFACE WATER

A description of the major streams in the Basin has been included in the INTRODUCTION to these memoranda.

Availability of data on the quality of surface waters of the Basin was found to be quite limited, according to the report, Water Quality Basic Data-Southeast River Basins, 1961, prepared by the Public Health Service for the U.S. Study Commission. The data were available from five stations and were outdated, most of it having been collected in the 1920's and 1930's. Anticipating gaps in the surface water quality data, three sampling stations were established by the Public Health Service on the Little Satilla River at Offerman, and the Satilla River at Waycross and Atkinson, Georgia. Samples were collected during November 1960, January and February 1961, and June 1961. The average dissolved oxygen at all three stations was found to range from 58.5 to 83.4 percent of saturation. Median coliform concentration ranged from 430 to 2,400 Most Probable Number (MPN) per 100 ml with a maximum of 46,000 MPN per 100 ml reported at the Waycross station. The alkalinity of the waters was relatively low with a maximum of 17.5 parts per million (ppm) reported. The average pH ranged from 5.3 to 6.4 and color values were generally high. The color and low pH are due primarily to the drainage of swamp waters into many streams of the Basin. At the present time, the surface waters of the Basin are not used for municipal or domestic water supplies due primarily to the abundance of ground water.

Available quality data show that with the exception of acidity neutralization and color removal where necessary, minimum treatment of the surface waters would be necessary for municipal, domestic, and most industrial uses.

GROUND WATER

Availability of data on ground water quality in the Basin was good. Chemical analyses were available at twenty-seven stations evenly distributed throughout the Basin. Ground water for municipalities and industries is obtained from the principal limestone aquifer which is discussed in the INTRODUCTION to these memoranda. Existing data show the dissolved solids content of ground water supplies to range from 119 to 557 ppm. All stations, except one, reported hardness in excess of 100 ppm with a range of 92 to 348 ppm. Four stations, Screven, Sea Island, Nahunta and

Yulee reported iron in excess of 0.3 ppm. Stations in Nassau County, Florida, reported higher dissolved solids, hardness and iron than those in the remainder of the Basin.

Treatment of ground water for reduction of hardness and the removal of iron and/or hydrogen sulfide is extensively practiced in the Basin. However the chemical quality of ground water presents no unusual treatment problems.

MUNICIPAL WATER SUPPLIES

INVENTORY

As shown by Table W-1, there are 32 municipal water systems whose source of water is within the Satilla-St. Marys Basin. These systems serve 98,590 persons in 31 communities and institutions. All of the water systems use ground water as the source of municipal supplies.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

The average water demand of the 32 municipal systems shown in Table W-1 is 10.24 mgd or 104 gpcd. Industries which depend on municipal systems for water supply consume 0.8 mgd or 7.5 percent of the total municipal system output.

Three of the municipal water supply systems are privately owned and 29 are publicly owned. All plants have periodic bacteriological examinations made of the water supplied to the public. Six systems have simple chlorination, and 14 have either aeration or some type of chemical treatment with chlorination. The 12 remaining systems provide no treatment, although the supplies have proven bacteriologically satisfactory up to the present time without disinfection. One system serving 21,500 persons provides fluoridation.

Undoubtedly difficult treatment problems exist, but none were reported. Some systems are known to have taste and odor difficulties.

WATER SUPPLY SYSTEM REQUIREMENTS FOR 1960

Although 11 municipalities reported that improvements to their present water supply systems were needed, a study of the basic data indicates that 28 of the water supply systems have source, treatment, storage, or distribution system inadequacies.

The recommended improvements (in terms of cost) as shown in Table W-2 include wells for 4 communities, disinfection for 15 aeration for 4, storage facilities for 10, high service pumps for 2, softening for 7, and distribution system extensions to serve approximately 6,500 persons in 12 municipalities.

(6/15/62)

FUTURE WATER SUPPLY SYSTEM REQUIREMENTS

Table W-3 shows the projected municipal water demands for 1975. It is anticipated that any subdivision shown in the 1960 inventory will have been incorporated into adjacent cities by 1975. The 31 municipal water systems expected to exist in 1975 will have an estimated total water demand of 23.52 mgd and will serve an estimated 153,300 persons. Water supply system improvements in addition to those listed as being needed in 1960 will be required to adequately serve this population. A study of the basic data indicates that wells will be required in 4 municipalities, disinfection equipment in one, treatment plant construction (new or additions to existing facilities) in one, elevated storage in 16, and expansion of distribution systems to serve an estimated 48,400 persons in 27 communities.

Table W-4 shows the projected municipal water demands for the year 2000. By the year 2000 the 32 municipal water systems in the Basin will serve an estimated 278,900 persons. The total water demand for this population is estimated to be 55.90 mgd. A study of the basic data indicates that additional improvements will be required between 1975 and 2000 with wells for 14 municipalities, disinfection equipment in 6, new treatment plant construction or additions in 9, elevated storage in 26, and expansion of distribution systems to serve an estimated population of 125,400 will be needed in 28 communities.

FUTURE WATER SUPPLY PROBLEMS

Ground water is abundant throughout the Basin with wells yielding upward to 5,800 gpm (8.4 MGD); however, increased withdrawal of ground water, both for industrial and municipal use and from uncapped flowing wells, have caused lowering of the artesian water level in some areas. Large and well defined cones of depression occur in the Brunswick, St. Marys, and Fernandina Beach areas. This increasing decline in the water level of the principal artesian aquifer and the accompanying indications of salt water intrusion are a cause of concern to water users.

For planning purposes, future municipal water demands were continued to be met from ground water supplies. This was due to lack of information concerning: brackish nature of surface waters in areas of need; beneficial effect of well dispersal upon water table decline; beneficial effect upon water table decline of capping flowing wells; and maximum allowable ground water withdrawal rates which would negate further salt water intrusion. Additional studies should be made to determine the feasibility of utilizing surface water for future needs of municipalities in areas of salt water intrusion.

(6/15/62)

Ground water aquifers in the Basin will be adequate for most future municipal water supply needs.

ANNUAL COSTS

The annual cost of providing water to municipal users in the Satilla-St. Marys Basin in 1960 is estimated to be $881,000. This cost, based on the cost of existing facilities, is broken down as follows:

Annual equivalent capital cost	$415,000
Annual replacement cost	21,000
Annual operation and maintenance cost	445,000
Total annual cost (1960)	$881,000

The total capital outlay required to improve the existing municipal water supply facilities in 1960 is estimated to be $1,430,000 as shown by Table W-2. The expenditure of this amount of money will strengthen the existing municipal water systems of the Basin and provide adequate service.

Between 1960 and 1975, additional expenditure will be necessary to improve water supply systems and meet the demands of the increased number of users. The capital cost of providing the additional necessary improvements by 1975 is estimated to be $4,064,000 as shown by Table W-3. This includes $72,000 for improvement of sources and treatment, $1,088,000 for storage facilities, and $2,904,000 for distribution facilities.

The annual cost of providing water to municipal users by 1975 is estimated to be $1,742,000. This includes annual equivalent capital cost of: (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on total investment as of 1975, and the operation and maintenance cost is based on the total installed systems as of 1975. A breakdown of this annual cost is given below:

Annual equivalent capital cost	$ 682,000
Annual replacement cost	31,000
Annual operation and maintenance cost	1,029,000
Total annual cost (1975)	$1,742,000

Between 1975 and 2000, municipal growth will make necessary an additional estimated capital expenditure of $11,289,000 to raise the water supply facilities to the necessary capacity. This includes $452,000 for source improvement and treatment facilities, $3,314,000 for storage capacity, and $7,523,000 for extension of distribution

TABLE W-1

BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS

SATILLA-ST. MARYS BASIN

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
FLORIDA									
Baldwin	1,272	1,300	wells	Dc	1.008	0.060	0.095	75	8
Callahan	782	750	well	ADc	0.360	0.075	0.110	147	
Callahan Prison	--	70	well	none	undet	none	0.010	140	
Fernandina Beach	7,276	7,275	wells	AtScDc	5.000	0.382	0.800	109	10
	--	120	well	none	undet	0.005	0.012	100	
Hilliard	1,075	500	well	ADh	0.504	0.060	0.050	100	
Macclenny	2,671	2,200	wells	DcKcp	0.576	0.060	0.150	68	
State Hospital	--	675	wells	ADc	1.580	0.108	0.200	300	
GEORGIA									
Alma	3,515	3,515	wells	Dc	1.440	0.060	0.200	57	
Baxley	4,268	4,050	wells	none	1.300	0.118	0.240	59	
Blackshear	2,482	2,510	wells	Dc	2.160	0.100	0.150	50	2
Broxton	907	910	well	Dh	0.288	0.065	0.020	23	
Brunswick	21,703	25,580	wells	AoDc	10.900	0.379	2.500	98	10
Country Club Park S/D	170	170	well	none	undet	undet	0.002	120	
Douglas	8,736	8,700	wells	Dc	2.000	0.735	1.100	127	32
Folkston	1,810	1,470	wells	As	1.550	0.075	0.115	77	5
Glynco NAS	1,700	1,700	wells	ACDc	1.300	0.297	0.200	71	
Hoboken	552	555	well	none	0.430	0.010	0.036	61	
Jekyll Island Authority	--	600	wells	none	1.080	0.260	0.520	--	
Kingsland	1,536	1,070	well	AmDh	0.360	0.065	0.100	84	
Nahunta	952	980	well	none	0.180	0.100	0.045	46	
Nicholls	930	930	wells	none	0.100	0.060	0.037	46	18
Odum	404	400	well	none	undet	0.075	0.025	64	
Patterson	719	720	well	Dh	1.220	0.020	0.010	25	
Pearson	1,615	1,660	wells	none	0.570	0.055	0.083	50	
St. Marys	3,272	2,000	well	AKcDc	0.580	0.090	0.250	125	5
St. Simons	3,199	3,200	wells	AMaKgSoDc	1.150	0.220	0.400	73	
Screven	1,010	630	well	none	undet	0.075	0.030	50	

(6/15/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
SATILLA-ST. MARYS BASIN

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
GEORGIA - Cont'd									
Sea Island (Unincorp)	--	1,000	wells	ADc	1.750	0.158	0.950	950	
Waycross	20,944	21,495	wells	DcScVt	6.000	1.780	1.730	82	
Industrial Park	--	1,500	wells	none	undet	0.020	0.053	35	75
Woodbine	845	350	well	A	0.720	0.060	0.021	60	
Totals		98,585					10.244	104	7.5

*Based on January 1960 constant dollars.

(6/15/62)

TABLE W-2
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
SATILLA-ST. MARYS BASIN

Municipality	Estimated Costs in $1,000				
	Source	Treatment	Storage	Dist. System	Total
FLORIDA					
Baldwin	--	2	20	--	22
Callahan	--	25	--	2	27
Callahan Prison	--	12	--	--	12
Fernandina Beach	--	50	70	--	120
Hilliard	--	33	--	35	68
Macclenny	24	8	--	28	60
Yulee	24	4	25	36	89
GEORGIA					
Alma	6	--	--	--	6
Baxley	--	8	--	34	42
Brunswick	--	--	272	--	272
Country Club S/D	--	2	--	--	2
Douglas	12	50	--	74	136
Folkston	--	33	--	22	55
Hoboken	--	2	27	--	29
Jekyll Island Authority	--	8	--	--	8
Kingsland	--	25	--	28	53
Nahunta	12	10	--	--	22
Nicholls	--	2	--	--	2
Odum	--	2	--	20	22
Patterson	--	--	35	--	35
Pearson	--	8	--	--	8
St. Marys	--	--	35	76	111
St. Simons	6	--	31	--	37
Screven	--	10	--	25	35
Sea Island	--	--	35	--	35
Waycross	--	--	82	--	82
Industrial Park	--	8	--	--	8
Woodbine	--	2	--	30	32
Totals	84	304	632	410	1,430

*Based on January 1960 constant dollars.

(6/15/62)

TABLE W-3
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
SATILLA-ST. MARYS BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA						
Baldwin	1,500	0.225	--	22	12	34
Callahan	1,150	0.175	--	--	22	22
Callahan Prison	100	0.015	--	--	--	--
Fernandina Beach	10,700	1.600	--	82	198	280
Hilliard	2,020	0.300	--	33	57	90
Macclenny	5,300	0.795	--	70	158	228
State Hospital	800	0.240	--	--	--	--
Yulee	600	0.060	--	--	--	--
GEORGIA						
Alma	5,900	0.885	--	82	143	225
Baxley	6,000	0.900	--	64	83	47
Blackshear	2,800	0.420	--	33	17	50
Broxton	1,200	0.180	--	--	17	17
Brunswick	44,300	6.650	--	354	1113	1467
Glynco NAS	1,700	0.200	--	--	--	--
Douglas	10,600	1.590	--	--	40	40
Folkston	3,000	0.450	--	35	70	105
Hoboken	650	0.065	--	--	6	6

(6/15/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
SATILLA-ST. MARYS BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Homeland	800	0.080	36	29	48	113
Jekyll Island	1,000	0.500	--	--	24	24
Kingsland	2,500	0.380	12	38	58	108
Nahunta	1,600	0.240	--	--	37	37
Nicholls	1,200	0.180	12	--	16	28
Odum	500	0.050	--	--	6	6
Patterson	1,000	0.150	--	--	17	17
Pearson	2,600	0.390	--	41	56	97
St. Marys	5,000	0.750	12	53	104	169
St. Simons	4,500	0.675	--	48	78	126
Screven	1,400	0.210	--	--	23	23
Sea Island	1,400	0.440	--	--	42	42
Waycross	30,000	4.500	--	82	420	502
Woodbine	1,500	0.225	--	22	39	61
Totals	153,320	23.520	72	1088	2904	4064

*Based on January 1960 constant dollars.

(6/15/62)

TABLE W-4
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
SATILLA-ST. MARYS BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA						
Baldwin	2,400	0.480	2	43	54	99
Callahan	1,800	0.360	--	35	39	74
Callahan Prison	100	0.015	--	--	--	--
Fernandina Beach	16,100	3.220	50	150	324	524
Hilliard	4,200	0.840	39	64	131	234
Macclenny	8,800	1.760	12	100	210	322
State Hospital	1,000	0.300	--	--	--	--
Yulee	600	0.090	--	--	--	--
GEORGIA						
Alma	9,800	1.960	12	110	234	356
Baxley	8,600	1.720	20	90	156	266
Blackshear	5,000	1.000	--	70	132	202
Broxton	1,700	0.340	20	35	30	85
Brunswick	102,800	20.560	93	1250	3510	4853
Glynco NAS	1,700	0.200	--	--	--	--
Denton	700	0.105	26	31	42	99
Douglas	20,000	4.000	49	220	564	833

(6/15/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
SATILLA-ST. MARYS BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Folkston	5,100	1.020	--	70	126	196
Hoboken	900	0.135	--	25	15	40
Homeland	1,200	0.240	--	35	24	59
Jekyll Island	2,000	0.600	--	--	60	60
Kingsland	3,500	0.700	32	48	60	140
Nahunta	2,400	0.480	14	38	48	100
Nicholls	2,000	0.400	2	41	48	91
Odum	800	0.120	--	--	18	18
Patterson	1,600	0.320	--	38	36	74
Pearson	4,000	0.800	12	56	84	152
St. Marys	7,500	1.500	18	82	150	250
St. Simons	6,000	1.200	12	60	90	162
Screven	1,900	0.380	--	35	30	65
Sea Island	1,900	0.490	--	48	30	78
Waycross	50,000	10.000	39	492	1200	1731
Woodbine	2,800	0.560	--	48	78	126
Totals	278,900	55.895	452	3314	7523	11,289

*Based on January 1960 constant dollars.

(6/15/62)

facilities.

The annual cost of providing water to municipal users by 2000 is estimated to be $3,721,000 assuming that all needs have been met by the year 2000. A breakdown of this annual cost is given below:

Annual equivalent capital cost	$1,230,000
Annual replacement cost	43,000
Annual operation and maintenance cost	2,448,000
Total annual cost (2000)	$3,721,000

BENEFITS

Storage for municipal water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obtained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

Because there is no established market value for water as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the Basin in the future, from public or private sources, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established is estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for municipal use included in any multi-purpose project constructed in the Basin would be at least equal to the cost of developing alternative sources.

DOMESTIC WATER SUPPLIES

INVENTORY

The methods for obtaining basic data on domestic water supply systems have been outlined previously in the PROCEDURES AND INVESTIGATIONS section of this memorandum.

The number of persons in the Basin served by existing municipal water supply systems is 98,585. The remainder of the Basin population, or 66,915 persons, is served by domestic water supply systems. Average per capita water demand is 50 gallons per day which indicates a total existing domestic water demand of 3.35 mgd.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Based on the analysis of the SERB area wide random-sample survey of domestic supplies, it is estimated that there are 14,900 domestic water supply systems in the Satilla-St. Marys Basin. Of this total, 5,170 systems have drilled wells, 7,160 have dug wells, 775 have bored wells, 955 have driven wells, and 800 have springs.

It is estimated that 1,216 systems have an insufficient source of supply and another 3,090 have sources of improper construction. There are 10,650 supplies which have pressure systems and of the remaining 4,248 supplies, 4,075 use hand pumps or buckets. There are 9,040 systems which do not meet accepted health standards and 4,100 systems have water quality problems, the most significant of which are hardness and high iron concentrations.

WATER SUPPLY SYSTEMS REQUIREMENTS FOR 1960

In order to provide a safe, potable supply of water for human consumption, certain minimum improvements will be needed for many of the existing domestic systems. These improvements consist of development of new sources for those systems which have either insufficient yield or sources of improper construction. Systems which presently use hand pumps or buckets should install pressure systems and those systems which do not meet health standards because of improper construction will need seals and covers. Softening or other treatment of those sources which have water quality problems is also needed. In addition, approximately 6,500 persons now served by domestic systems should connect to municipal water supply systems. Costs for providing these needs are listed below.

Total capital outlay to improve existing domestic water supply systems to meet accepted health standards is estimated to be $6,682,700. This includes $2,737,000 for development of new sources $332,200 for sanitary seals and covers, $1,915,500 for pressure systems, $1,185,900 for treatment facilities, and $512,100 for complete new systems.

FUTURE WATER SYSTEM REQUIREMENTS

In determining future requirements it was assumed that all domestic water supply systems in the future will be pressurized and will meet accepted health standards. By 1975, it is estimated that a total of 12,400 domestic systems serving 55,900 persons will be in existence in the Satilla-St. Marys Basin. This represents a decrease in population served by domestic water systems and will result in the abandonment of 2,500 systems between 1960 and 1975.

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By 2000, an estimated 38,300 persons will be served by a total of 8,500 domestic water supply systems. This also represents a decrease in population served by domestic water systems which will result in the abandonment of an additional 3,900 systems between 1975 and 2000.

Average domestic water demand by 1975 will be 3.9 mgd, based on 70 gpcd and in 2000 it will be 3.8 mgd based on 100 gpcd.

ANNUAL COSTS

For the purposes of this memorandum it is assumed that present and future needs of the farm and rural non-farm domestic water systems will be met on an individual basis.

The annual cost of providing domestic water from existing systems is estimated to be $1,033,400. Based on an estimated existing capital investment of $17,502,800, the breakdown of annual cost is given below:

Annual equivalent capital cost	$ 579,300
Annual replacement cost	274,400
Annual operation and maintenance cost	179,700
Total annual cost (1960)	$1,033,400

The annual cost of providing water for domestic water supply systems in 1975 is estimated to be $1,211,600 based on an estimated total investment of $14,566,500. The breakdown of total annual cost for 1975 is given below:

Annual equivalent capital cost	$ 707,300
Annual replacement cost	335,000
Annual operation and maintenance cost	169,300
Total annual cost (1975)	$1,211,600

The annual cost of providing water from the domestic systems expected to exist in 2000 is estimated to be $830,600 based on an estimated total investment of $9,985,300. The breakdown of annual cost for the year 2000 is as follows:

Annual equivalent capital cost	$484,900
Annual replacement cost	229,700
Annual operation and maintenance cost	116,000
Total annual cost (2000)	$830,600

INDUSTRIAL WATER SUPPLIES

INVENTORY

Data secured by field surveys of 41 industrially-owned water

systems are shown in Table W-5. Only those industries with their own source of water were surveyed, although 11 of the industries shown in Table W-5 supplement their supplies with water from municipal water systems. The 41 industries surveyed use 159.34 mgd from their own sources, and the total amount of water supplied to all industries by municipal systems is 0.8 mgd. Thus, the total industrial water use in the Basin is approximately 160.1 mgd. The pulp and paper industry is the largest user of water. Four of the 41 industries surveyed were pulp and paper mills and they use 115.5 mgd or 72 percent of the total water demand. The next largest industry, naval stores, account for 24.8 mgd or 15 percent of the total water demand.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Forty of the industries surveyed obtain water (not including that from municipal systems) from wells only, and one obtains water from surface sources only. One industry reported that the existing source of water was inadequate to meet demands.

Three of the industries provide simple chlorination, 2 provide softening, and the remainder have no treatment for water used for drinking and sanitation. Sixteen industries reported treatment of water used for processing and boiler use. Process and boiler water was softened at 7 of the plants, one of the plants used settling, and 8 provided simple chlorination. Eight plants reported treating water for cooling. Six plants used chlorination for cooling water, one softened, and one provided settling only.

No attempt was made to determine total consumptive water use by industry, although it is believed to be relatively small.

FUTURE WATER SUPPLY REQUIREMENTS FOR 1975 AND 2000

Industrial water use from industrially-owned sources by 1975 and 2000 is estimated to be 215.22 mgd and 320.62 mgd respectively. Table W-6 gives the projected water demands and water system needs (in terms of cost) for 1975 and 2000.

Between 1960 and 1975, industrial water supply system needs for existing and new plants will include installation of 20 wells, 21 chlorinators, 6 storage facilities, and 4 treatment plants (new or additions to existing facilities).

Industrial development will have expanded by 2000 to the point that water supply system needs will include provision of 48 new wells, 9 storage facilities, 3 chlorinators, and 4 treatment plants (new or additions to existing facilities).

TABLE W-5
BASIC DATA ON INDUSTRIAL WATER SUPPLY SYSTEMS
SATILLA-ST. MARYS
BASIN

Location by State and County	Code	Type of Industry	Number of Employees	Drinking and Sanitation			Processing and Boiler			Cooling			Total Plant Demand mgd
				Source	Treatment	Average mgd	Source	Treatment	Average mgd	Source	Treatment	Average mgd	
FLORIDA													
Duval	A	creosoting	35	city	--	--	wells	zeolite filter	0.030				0.030
Nassau	C	pulp & paper	600	city	--	--	wells	chlor	10.000	wells	chlor	6.000	16.000
	D	pulp & paper	400	wells	soften	*	wells	soften	*	wells	soften	*	30.000
	F	fish oil	70	well	none	*	well	none	*				0.075
	H	paper products	300	well	chlor	*	well	chlor	*				0.075
GEORGIA													
Appling	A	naval stores	40	well	none	*	well	none	*	well	none	*	0.004
	B	meat pk	3	well	none	*	well	none	*	well	none	*	0.012
	C	creosoting	6	city	--	--	city & well	soften	0.003				0.003
Atkinson	D	ice	3	well	none	*	well	none	*	well	none	*	0.200
	E	naval stores	3	well	none	*	well	none	*				0.001
Bacon	G	meat pk	46	well	none	*	well	none	*	well	none	*	0.036
Brantley	H	naval stores	14	well	none	*	well	none	*	well	none	*	0.100
	I	meat pk	4	well	none	*	well	none	*	well	none	*	0.004
	J	meat pk	2	well	none	*	well	none	*	well	none	*	0.003
Camden	R	pulp & paper	800	wells	none	*	wells	soften	*	recycle	--	*	35.000
	W	sea food	2	well	none	*	well	none	*	well	none	*	0.005
	X	paper products	400	well	none	0.004	wells	none	*	recycle	none	*	0.304
Coffee	K	dairy	4	well	none	*	well	none	*	well	none	*	0.001
	N	metal	50	city	--	--	city	--	--	pond	none	0.020	0.020
	O	naval stores	14	city	--	--	pond	none	*	pond	none	*	undet
	P	ice	4	city	--	--	well	none	0.180				0.180
	Q	dairy	40	city	--	--	city	--	--	well	none	0.390	0.390
Glynn	S	chemical	140	wells	none	0.115	wells	soften	0.590	wells	none	11.000	11.705
	U	sea food	105	wells	chlor	*	wells	chlor	*	wells	chlor	*	0.060
	V	sea food	140	city	--	--	well	chlor	*	wells	chlor	*	undet
	Y	sea food	500	well	none	*	well	chlor	*	well	none	*	0.900
	Z	sea food	115	well	none	*	well	none	*	well	none	*	0.013
	AA	sea food	150	wells	none	*	wells	none	*	wells	none	*	0.080
	CC	creosoting	63	well	none	*	well	none	*	well	none	*	0.040
	DD	chemical	60	well	none	*	well	none	*	well	none	*	0.040
	EE	pulp mill	700	well	none	0.005	well	soften	34.500	recycle	chlor	*	34.505
	FF	sea food	240	city	--	--	wells	chlor	*	wells	chlor	*	3.200
	GG	dairy	6	well	none	*	well	none	*	well	none	*	0.067
	HH	gypsum	150	well	chlor	*	well	chlor	*				0.480
	WW	naval stores	989	wells	none	0.002	well	chlor	*	well	chlor	*	24.662

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TABLE W-5 (CONT'D)
BASIC DATA ON INDUSTRIAL WATER SUPPLY SYSTEMS
SATILLA-ST. MARYS
BASIN

Location by State and County	Code	Type of Industry	Number of Employees	Drinking and Sanitation			Processing and Boiler			Cooling			Total Plant Demand mgd
				Source	Treatment	Average mgd	Source	Treatment	Average mgd	Source	Treatment	Average mgd	
GEORGIA (cont'd)													
Ware	LL	naval stores	13	well	soften	*	well	soften	*				0.015
	NN	dairy	52	well	none	*	well	none	*	well	none	*	0.080
	OO	meat pk	3	well	none	*	well	none	*	well	none	*	0.002
	TT	meat pk	45	well	none	*	well	none	*	well	none	0.028	0.040
	UU	ice	25	city	--	--	well	none	*	well	none	*	0.710
	VV	R R shop	1,300	city	--	--	Satilla R	settling	*	Satilla R	settling	*	0.296
TOTAL													159.338

* Breakdown of water use not available. See last column for total demand.

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TABLE W-6
INDUSTRIAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* - 1975 AND 2000
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Estimated 1975 Requirements mgd	Estimated 1975 Requirements Costs	Estimated 2000 Requirements mgd	Estimated 2000 Requirements Costs
FLORIDA					
Duval	A	0.030	--	0.030	--
Nassau	C	21.300	164,000	26.800	36,000
	D	45.000	106,000	75.000	2,100,000
	F	0.075	2,000	0.075	--
	H	0.125	--	0.187	--
GEORGIA					
Appling	A	0.006	2,000	0.010	--
	B	0.080	--	0.200	--
	C	0.025	--	0.040	--
Atkinson	D	0.200	--	0.200	--
	E	0.005	--	0.010	--
Bacon	G	0.060	2,000	0.110	12,000
	New[1]	0.003	14,000	0.005	--
Brantley	H	0.214	12,000	0.500	39,000
	I	0.010	2,000	0.030	12,000
	J	0.015	2,000	0.045	--
Camden	R	38.800	8,000	48.500	1,468,000
	W	0.009	--	0.019	--
	X	0.336	2,000	0.420	27,000
Coffee	K	0.004	6,000	0.013	--
	N	0.020	--	0.020	--
	O	undet	--	undet	--
	P	0.188	--	0.188	--
	Q	0.550	4,000	0.830	12,000
	New[2]	0.100	42,000	0.220	--
Glynn	S	21.000	92,000	35.000	176,000
	U	0.080	--	0.098	--
	V	undet	--	undet	--
	Y	1.350	20,000	2.160	94,000
	Z	0.017	2,000	0.020	--
	AA	0.105	2,000	0.130	--
	CC	0.057	2,000	0.114	--
	DD	0.040	2,000	0.040	--
	EE	46.000	1,780,000	69.000	2,892,000
	FF	4.200	12,000	5.250	82,000
	GG	0.112	2,000	0.280	14,000

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TABLE W-6 (CONT'D)
INDUSTRIAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* - 1975 AND 2000
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Estimated 1975 Requirements mgd	Estimated 1975 Requirements Costs	Estimated 2000 Requirements mgd	Estimated 2000 Requirements Costs
GEORGIA - Cont'd					
Glynn	HH	0.860	12,000	1.450	48,000
	WW	33.000	126,000	52.500	236,000
Ware	LL	0.020	--	0.046	--
	NN	0.170	2,000	0.330	--
	OO	0.002	--	0.004	--
	TT	0.083	2,000	0.167	12,000
	UU	0.570	--	0.280	--
	VV	0.300	--	0.300	--
Totals		215.220	$2,424,000	320.620	$7,260,000

*Based on January 1960 constant dollars.

[1]Naval Stores
[2]Canning

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FUTURE WATER SUPPLY PROBLEMS

As in the case of municipal water supplies, large and well-defined cones of depression have developed in the ground water aquifers near large industrial water consumers. The areas affected are in Glynn and Camden Counties in Georgia and in Nassau County in Florida. For planning purposes, use of ground water supplies to meet demands was continued into the future. Although it is believed that increased use of ground water in the above areas may cause serious salt water intrusion problems, further studies should be made (see MUNICIPAL WATER SUPPLIES section, Future Water Supply Problems) before alternate surface water sources are developed for industrial use. In the major portion of the Basin, however, future industrial water supply needs can be met adequately from existing ground water sources.

ANNUAL COSTS

Existing industrial water supply systems are reported to be adequate for 1960 needs. The annual cost of providing industrial water in 1960 from existing supplies is estimated to be $5,224,000. A breakdown of this cost, based on the cost of existing facilities, is given below:

Annual equivalent capital cost	$ 628,000
Annual replacement cost	34,000
Annual operation and maintenance cost	4,562,000
Total annual cost (1960)	$5,224,000

The annual cost of providing the industrial water required by 1975 is estimated to be $6,849,000. This includes annual equivalent capital costs of existing facilities in 1960, and facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on the total investment as of 1975, and the operation and maintenance cost is based on the total installed systems as of 1975. A breakdown of these costs is given below.

Annual equivalent cost	$ 745,000
Annual replacement cost	41,000
Annual operation and maintenance cost	6,063,000
Total annual cost (1975)	$6,849,000

The annual cost of providing the industrial water needed by 2000 is estimated to be $10,189,000, assuming that all the needs have been met by the year 2000. A breakdown of this cost is given below:

Annual equivalent capital cost	$1,098,000
Annual replacement cost	48,000
Annual operation and maintenance cost	9,043,000
Total annual cost (2000)	$10,189,000

BENEFITS

Storage for industrial water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obtained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

Because there is no established market value for water as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the Basin in the future, from public or private sources, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established is estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for industrial use included in any multi-purpose project constructed in the Basin would be at least equal to the cost of developing alternative sources.

SUMMARY

1960

The total average water demand of existing (1960) municipal, domestic, and industrial water systems whose source is within the Satilla-St. Marys Basin is estimated to be 172.93 mgd. There are 32 municipal water systems (serving 98,585 persons), an estimated 14,900 domestic water systems (serving 66,915 persons), and 41 industrially-owned water systems. The total annual cost of providing water for municipal, domestic and industrial uses is estimated to be $7,138,000.

1975

By 1975, the total average water demand of municipal, domestic, and industrial water systems whose source of water is within the Basin is estimated to be 242.6 mgd. The municipal water systems will serve 153,300 persons, and there will be an estimated 12,400 domestic water systems serving 55,900 persons. The total annual cost of providing water for municipal, domestic, and industrial uses is estimated to be $9,803,000 by 1975.

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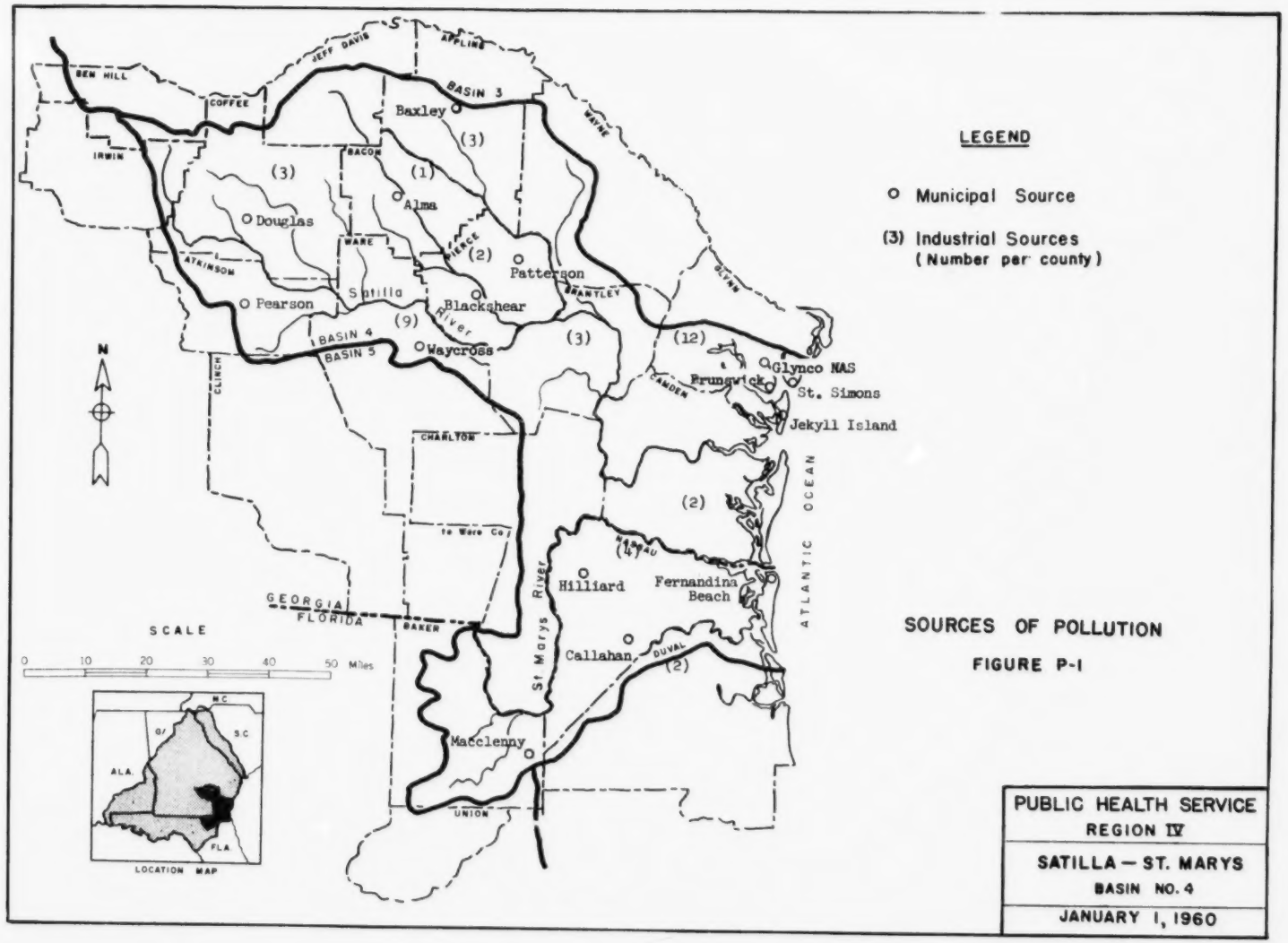
2000

By the year 2000, the total average water demand of municipal, domestic and industrial water systems whose source of water is within the Basin is estimated to be 380.3 mgd. The municipal water systems will serve 278,900, and there will be an estimated 8,500 domestic water systems serving 38,300 persons. The total annual cost of providing water for municipal, domestic, and industrial water uses is estimated to be $14,741,000 by the year 2000.

Although there is a salt water intrusion problem in the Basin in sereral areas of high water demand, it is expected that existing water supply sources, ground or surface, will be adequate to meet all demands in the year 2000 if they are properly developed. Additional studies will be needed in the problem areas to determine the most feasible method for obtaining water supplies.

Many municipal and industrial water supply systems will need softening or aeration of their water supplies in the future.

POLLUTION ABATEMENT


BEN HILL
JEFF DAVIS
APPLING
COFFEE
BASIN 3
WAYNE
IRWIN
BACON
Baxley
(3)
(3)
(1)
Alma
Douglas
WARE
PIERCE
(2)
Patterson
BRANTLEY
GLYNN
ATKINSON
Pearson
Satilla
Blackshear
River
(9)
BASIN 4
BASIN 5
Waycross
(3)
(12)
Glynco NAS
Brunswick
St. Simons
Jekyll Island
CAMDEN
CLINCH
CHARLTON
(2)
ATLANTIC OCEAN
(4)
NASSAU
Hilliard
Fernandina Beach
GEORGIA
FLORIDA
BAKER
St Marys River
Callahan
DUVAL
(2)
Macclenny
UNION
N
SCALE
0 10 20 30 40 50 Miles
N.C.
S.C.
ALA.
FLA.
LOCATION MAP
LEGEND
Municipal Source
(3) Industrial Sources
(Number per county)
SOURCES OF POLLUTION
FIGURE P-1
PUBLIC HEALTH SERVICE
REGION IV
SATILLA – ST. MARYS
BASIN NO. 4
JANUARY 1, 1960

P-1-a

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal and industrial sewage works which discharge to the Satilla-St. Marys Basin.

Projected future pollution abatement requirements for industries and municipalities by the year 1975 and 2000 are presented, as are suggested solutions to present and anticipated future inadequacies. In connection with these solutions, an appraisal of the benefits to be derived from the proposed program and the annual costs of pollution abatement are included.

PROCEDURES AND INVESTIGATIONS

Existing data on pollution abatement in the Basin were obtained from reports, records, and correspondence of the Florida State Board of Health, the Georgia Department of Public Health, the Georgia State Chamber of Commerce, the Gerogia Department of Commerce, the U.S. Department of Agriculture and other Federal and State agencies. Where data were found to be lacking or outdated, extensive field investigations were conducted. Field investigations were conducted by the Georgia Department of Public Health and the Florida State Board of Health, and data were submitted to the Public Health Service for inclusion in this memorandum. These field investigations included visits to municipalities, small communities, industries, and institutions.

Data were obtained regarding 17 municipal (which includes 3 institutions) and 41 industrially owned sewage and waste works in the Basin (Figure P-1). Industries connected to municipal sewer systems were not inventoried. The data were carefully studied to establish both the present and future pollution abatement requirements.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for those communities not listed in the census reports.

Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960, modified by considerations of changing economic conditions. However, the population projections of urban areas (municipalities or 2500 or more) were adjusted to match projections made by the U.S. Study Commission.

Existing industries are expected to increase or decrease their waste discharges in the future in proportion to the projected industrial growth or decline. For the purpose of this memorandum, it is

assumed that municipalities of 800 or more should be sewered now and municipalities of less than 800 should be sewered whenever the present methods of disposal are considered inadequate. It is also assumed that each municipality, regardless of population, now partially sewered should extend its collection system to serve the total population.

In the administration of "Grants for Construction" under Section 6 of Public Law 660 and its amendments, the Public Health Service has established "The substantial removal of settleable solids" as the minimum acceptable treatment for projects in which the Federal Government participates. In general, the Public Health Service considers primary treatment to be the minimum acceptable degree of treatment for municipal sewage and an equivalent treatment the minimum for industrial liquid wastes. The need for additional treatment has been determined on the basis of expected dilution water available during periods of low stream flow and/or downstream water use. With the exception of the Florida portion of the Basin, stabilization ponds have been recommended for most municipalities with less than 1500 persons.

It is assumed that primary treatment plants will effect 35 percent BOD removal and secondary plants will effect 85 percent BOD removal. Tertiary treatment or a greater than 85 percent BOD removal has not been considered for purposes of reducing low flow requirements. At these higher treatment efficiencies, dilution water requirements for water quality control depend on dilution of nutrients and chemicals present in the water rather than dilution of remaining BOD. Plant nutrients and chemicals are reduced very little, if any, in conventional sewage treatment plants and must, therefore, be considered as important pollutants in sewage effluents.

Sewage works costs have been estimated on the basis of per capita cost data developed by the Public Health Service and adjusted on the basis of the January 1, 1960 Engineering News-Record Construction Cost Index for Atlanta, Georgia. Engineering, legal, and financing costs have been added on the basis of United States experience for the period July 1956-June 1959. Sewage system costs include the cost of structures, devices, equipment, and appurtenances intended for the collection and pumping of sewage. Treatment plant costs include the cost of treatment facilities and outfall lines.

Annual equivalent capital costs, annual operation and maintenance costs, and replacement costs of existing and needed pollution abatement facilities were estimated on the basis of January 1, 1960 constant dollars. An interest rate of 4¼ percent was used for determining annual costs for both industries and municipalities.

GENERAL

Water pollution may be defined as the adding to water of any substance, or the changing of water's characteristics in any way which in-

terferes with its use for legitimate purposes. Water polluting substances may be classified according to eight general categories: (1) Sewage and other oxygen demanding wastes, (2) infectious agents, (3) plant nutrients, (4) organic chemical exotics, (5) sediments, (6) radioactive substances, (7) heat, and (8) toxic and other mineral and chemical substances.

The Nation and its communities, as well as business and private operations and individuals, incur losses or damages because of water pollution. Some of these losses or damages are reflected directly in additional costs for construction, operation and maintenance of water treatment facilities. By far the larger share of the total damages is not directly accountable. The impairment to health, the loss or dimunition of fishing and recreational uses, and depreciated property values, caused by polluted waters, have an adverse economic impact which is diffused throughout society. This is paid for through the reduction in utility of the water resources and the restriction on economic growth rather than through dollar payments for corrective devices. Unfortunately, these indirect consequences of pollution are not readily expressed in dollar terms because of their diffusiveness and because they are not recorded by direct, open-market transactions. Nevertheless, such adverse consequences are real and constitute a handicap to the fulfillment of economic and social goals.

Pollution control measures alleviate these adverse conditions and produce economic benefits associated with the improved waters. These benefits are often not apparent to the public, however, because they constitute insurance for future usefulness as well as for immediate purposes, or they may be indirect or intangible. The computation of these benefits faces the same difficulties as the computation of the total damages. That is, the dollar measurement problem has not yet been solved and a yardstick for actions or events not recorded in market transactions is lacking. Many of the benefits from pollution control are in this nonmarket realm, e.g., enhancement of fishing and recreational opportunity, protection of health, scenic improvement, and assurance of the future utility of water resources for various other purposes. The private market price system, therefore, cannot be relied upon solely or chiefly to provide the measurement. New devices for taking into account the social or public values must be devised.

INVENTORY OF POLLUTION ABATEMENT

SOURCES OF POLLUTION

The surface waters of the Basin are used for the final disposal of liquid wastes, treated and untreated, from 17 municipalities (including 3 institutions), and 41 industries as shown by Tables P-1 and P-2. Municipalities and institutions discharge 9.1 mgd of sewage of which 4.5 mgd has undergone treatment of some type and industries discharge 149.4 mgd of which less than 1.0 mgd has undergone treatment

of some type.

A total of 73,585 persons are served by the 17 municipalities and institutions which discharge to the Satilla-St. Marys Basin. The total population equivalent (PE) of the municipal sewage in the Basin is estimated to be 86,500 before treatment and 62,800 of this total is discharged to the Basin's waters after treatment.

The industrial wastes produced in the Basin include food, chemical, lumber, naval stores, and pulp and paper wastes. The food industry which is the most numerous industry in the Basin accounts for 19 of the 41 industries inventoried. The strength of the organic wastes from the 33 industries for which data were available is estimated to be 4,066,700 PE based on BOD. The PE of one industry inventoried was undetermined. There are 7 other industries which produce inorganic liquid wastes such as acids, alkalies, sediments, etc. The total population equivalent of the industrial wastes after treatment is estimated to be 4,066,400.

The waters of the basin also receive pollution from natural sources and from the agricultural use of the land. Pollution from natural sources include organic material leached from the decaying matter in the forests and swamps and minerals dissolved from the soil and rocks. The pollution resulting from the agricultural use of the land includes organic and mineral fertilizers, insecticides, pesticides, and herbicides which are washed into the waters during heavy rains or which are inadvertently deposited into the waters during application. Silt eroded from roadsides and from land, especially in the Piedmont Province, is a pollutant in the upper portion of the Basin. Drainage from livestock feed lots, dairy barns, pig pens, manure heaps, and other farm refuse also adds to the pollution load carried by the streams.

EXISTING SEWAGE TREATMENT FACILITIES

As shown by Table P-1, 7 municipalities and institutions provide secondary treatment for sewage collected from 17,900 persons (or 24 percent of the total sewered population discharging sewage to the Basin's waters).

There are 5 municipalities and institutions in the Basin which provide primary treatment for the sewage collected from 11,600 persons (or 16 percent of the total sewered population discharging sewage to the Basin's waters).

The remaining 5 municipalities and institutions which discharge sewage to the Basin's waters provide no treatment. Approximately 44,100 persons (or 60 percent of the total sewered population discharging sewage to the Basin's waters) are served by the collection systems in these municipalities.

(6/15/62)

TABLE P-1
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
SATILLA-ST. MARYS BASIN

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity PE 1,000s	Design Capacity Flow mgd	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Receiving Stream
FLORIDA									
Callahan	782	560	0.040	primary	1.50	0.150	560	450	Alligator Cr-Nassau R
Fernandina Beach	7,276	4,500	0.400	primary	7.50	0.600	4,500	2,920	Amelia R-St. Marys R
Hilliard									
Air Traffic Center	--	370	0.037	secondary	undet	undet	370	40	ditch-Little St.Marys R
Macclenny	2,671	1,750	0.116	secondary	4.14	0.414	1,750	440	Turkey Cr-St. Marys R
Fla State Hospital	--	675	0.068	secondary	1.60	0.160	675	35	ditch-Turkey Cr-St.Marys R
GEORGIA									
Alma	3,515	2,280	0.353	none	--	--	4,900	4,900	Big Hurricane Cr-Satilla R
Baxley	4,268	3,150	0.500	secondary	5.00	0.500	3,150	350	Sweetwater Cr-Satilla R
Blackshear	2,482	2,480	0.120	secondary	3.00	0.300	2,500	370	Alabaha R
Brunswick	21,703	21,700	2.170	none	--	--	22,500	22,500	Brunswick R
Glynco NAS	--	2,000	0.500	secondary	2.85	0.340	2,000	200	Thornhill Cr-Troup Cr-Mackey River
Douglas	8,736	7,500	1.640	secondary	10.00	1.000	13,000	1,950	20 mile Cr-17 mile Cr-Satilla R
Jekyll Island	--	2,000[1]	0.040	none	--	--	2,000	2,000	Jekyll R
Patterson	719	120	0.040	none	--	--	120	120	br-Little Satilla R
Pearson	1,615	800	0.080	primary	0.75	0.075	800	600	Swamp-L Red Bluff Cr-Satilla R
St. Simons	3,199	4,200[2]	1.000	primary	5.00	0.500	4,200	3,000	Dunbar Cr-Fredrica R
Waycross	20,944	18,000	2.000	none	--	--	22,000	22,000	ditch-Satills R
Industrial Park	--	1,500	0.020	primary	3.50	0.350	1,500	970	Kettle Cr-Satilla R
TOTALS		73,585	9.124				86,525	62,845	

1 Equivalent population
2 Included 500 in Sea Island

(6/15/62)

TABLE P-2
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
FLORIDA									
Duval	A	35	wood preser	creosote	0.010	none	200	200	Red Canal-St.Marys R
	B	15	machine shop	oil	undet	none	500	500	ditch
Nassau	C	600	pulp & paper	sulphite process	16.000	none	360,000	360,000	Amelia R
	D	400	pulp mill	sulphite process	30.000	none	2,000,000	2,000,000	Amelia R & Atlantic O
	F	70	food	fish oil	0.075	none	9,200	9,200	Amelia R
	H	300	paper products	sanitary	0.008	none	300	300	Cypress Swamp
GEORGIA									
Appling	A	40	naval stores	oils & solvents	0.004	none	200	200	ditch to Sweetwater Cr
	C	6	wood preser	creosote	0.001	none	50	50	canal to swamp
	B	3	food	meat pkg	0.012	none	250	250	undet
Bacon	F	3	food	meat pkg	0.005	none	undet	undet	ditch to Hurricane Cr
Brantley	H	14	naval stores	oils & solvents	0.100	none	1,000	1,000	ditch to swamp
	I	4	food	meat pkg	0.004	french drain	150	150	swamp
	J	2	food	meat pkg	0.003	none	140	140	ditch to L Buffalo Cr
Camden	R	800	pulp & paper	Kraft	32.000	none	750,000	750,000	North R Estuary
	W	2	seafood	shrimp process	0.005	none	125	125	St. Marys R
Coffee	M	100	food	poultry pro	0.270	screens	2,500	2,500	17 mi Cr-Satilla R
	N	50	machine shop	inorganic	0.051	none	--	--	17 mi Cr-Satilla R
	O	14	naval stores	oils & solvents	0.002	none	100	100	17 mi Cr-Satilla R

(6/15/62)

TABLE P-2 (CONT'D)
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
GEORGIA (cont'd)									
Glynn	S	140	chemical	caustic & chlorine	11.700	none	--	--	Purvis Cr-Brunswick R
	HH	150	Gypsum	sanitary & pro	0.360	none	4,800	4,800	East River
	U	105	seafood	organic	0.060	none	1,500	1,500	East River
	V	140	seafood	organic	0.090	none	2,250	2,250	East River
	Z	115	seafood	organic	0.009	none	3,750	3,750	East River
	AA	150	seafood	organic	0.060	none	6,000	6,000	East River
	BB	35	seafood	organic	0.012	none	3,500	3,500	East River
	CC	63	wood preser	creosote	0.040	oil separator	600	300	ditch to Brunswick R
	DD	60	chemical	inorganic	0.040	none	--	--	Back River
	EE	700	pulp & paper	process	34.000	none	885,000	885,000	Academy Cr-East R
	GG	6	food	dairy	0.067	none	60	60	Gilson Creek
	WW	989	naval stores	oils & solvents	23.800	none	20,000	20,000	Terry Cr to Back R
Pierce	JJ	3	food	meat pkg	0.001	none	110	110	undet
	KK	3	food	meat pkg	0.001	none	150	150	br-Alabaha R
Ware	LL	13	naval stores	oils & solvents	0.012	none	250	250	br-Kettle Cr-Satilla R
	MM	36	food	pecan process	0.003	none	--	--	storm sewer-Satilla R
	NN	52	food	dairy	0.080	none	290	290	Kettle Cr-Satilla R
	PP	36	laundry	brine soap,etc.	0.130	none	8,000	8,000	canal to Satilla R
	SS	48	laundry	brine soap,etc.	0.020	none	1,750	1,750	canal to Satilla R
	QQ	100	food	pecan process	0.010	none	--	--	canal to Satilla R
	RR	16	rr shop	oils,acids,etc.	0.018	evaporation lagoon	--	--	undet
	TT	45	food	meat pkg	0.040	none	4,000	4,000	Kettle Cr-Satilla R
	VV	1,300	rr shop	oil	0.296	oil separat-ors & skimmers	--	--	canal-Satilla R
				TOTALS	149.399		4,066,725	4,066,425	

(6/15/62)

The sewage treatment plant listed for St. Simons, Georgia also serves Sea Island.

As shown by Table P-2, only 5 of the 41 industries listed provide treatment of some degree to their liquid wastes. Two of these, however, provide no reduction of the BOD load discharged from the plants. The remaining 36 industries provide no treatment for their liquid wastes. Thus, a total of 38 industries are listed as providing no reduction of the BOD load discharged to the Basin's waters. Of the three industries providing treatment, two provide oil separators and one evaporation lagoon.

All other industries in the Basin discharge liquid wastes either to septic tanks with subsurface drain fields or to municipal sewer systems. Industries disposing of liquid wastes by these methods were not inventoried and no data are available.

Soil conservation practices used in many areas of the Basin are very useful in preventing pollution resulting from agricultural use of the land. Good erosion preventative measures, practiced by the highway and railroad maintenance departments assist in the control of sediment coming from roadway embankments. There are no pollution control measures used especially for the purpose of abating pollution from natural sources.

EFFECTS ON STREAMS

Very limited data are available on the effects of municipal and industrial waste discharges on the quality of the surface waters in the Satilla-St. Marys Basin. The data that are available are limited mostly to the chemical quality of the surface waters. Much of these data have been summarized and are presented in the report, Water Quality Basic Data-Southeast River Basins, 1961, prepared for the U.S. Study Commission by the Public Health Service.

Chemical quality data were available at four surface stream stations in the Basin; two in Georgia on the main stem of the Satilla River and two in Florida on the main stem of the St. Marys River.

Based on the data that was available, the waters of both the Satilla and St. Marys Rivers are relatively soft. Hardness ranged from 8 to 19 ppm and total dissolved solids from 49 to 80 ppm.

During November 1960, January and February 1961 and June 1961, the Public Health Service conducted field studies at three stations in the Satilla-St. Marys Basin; one on the Little Satilla River near Offerman, Georgia and the other two on the Satilla River near Waycross and at Atkinson, Georgia. The dissolved oxygen level reported at all three stations was slightly depressed, especially in the Little Satilla River where dissolved oxygen averages ranged from 59

to 68 percent of saturation. Coliform concentrations at all three stations were low, the median ranging from 430 to 2400 Most Probable Number (MPN) per 100 ml. Based on the analyses made, it appears that the waters at these stations were relatively free from municipal or industrial waste pollution.

As is typical of many of the surface streams in the lower Coastal Plain, the alkalinity and pH of the waters were low and the color high.

Observations of several of the surface streams of the Basin were made by the Georgia Department of Public Health during the inventory phase of this study and are quoted below.

"1. 11/25/61. Headwaters of Satilla River, one mile east of Ocilla on State Highway #32. The river at this point has a wide flood plain with swamplike characteristics. There was no flow through the main channel at the time of visit.

2. 9/14/61. Satilla River Bridge on State Highway #158, northwest of Waycross. About a quarter of a mile below the confluence of 17-Mile Creek. River about 250 feet wide, flow about one foot per second; the water had typical appearance and swamp coloring; no scum, odor, or other indications of pollution observed.

3. 9/14/61. Satilla River U.S. Highway #1 Bridge, north of Waycross. River approximately 100 feet wide with a flow estimated at two feet per second. Water was typical dark swamp color with some turbidity caused by recent rains. Fish were observed feeding. There was no odor, scum, deposits, or other indications of pollution.

4. 9/14/61. Satilla River Bridge, U.S. Highway #82, east of Waycross. River 250 to 300 feet wide with an estimated flow of approximately one foot per second. This observation point is about half a mile above the discharge point of the Waycross outfall sewer. There was no odor, scum, solids, deposits or any other signs of pollution.

5. 9/30/61. Satilla River, U.S. Highway #301, north of Nahunta. Water typical swamp color, broad flood plain including Big Satilla Creek. No evidence of pollution observed. Same conditions observed in Big Satilla Creek. Evidence of fishing; however, no fishermen were observed.

6. 9/28/61. Satilla River, U.S. Highway #84, east of Nahunta. River at low stage. A large sand bar of clean, white sand observed in considerable portion of the wide river bed.

No evidence of pollution noted.

7. 9/22/61. Satilla River Bridge, U.S. Highway #11, at Woodbine. River approximately 1,000 feet wide, flowing at rather high velocity due to heavy rains in the area. The water was somewhat turbid; some vegetation observed floating in water which had apparently been washed in from swamps, but there were no signs of manmade pollution. On 9/29/61 the stream was no longer turbid, but had a swamp water coloring.

8. 9/30/61. Big Satilla Creek, U.S. Highway #1, south of Baxley. Water had typical swamp coloring; no signs of pollution.

9. 9/30/61. Big Satilla Creek, State Highway #121, north of Bristol. Swampy flood plain; typical swamp water coloring; no signs of pollution.

10. 9/30/61. Big Satilla Creek, State Highway #32, west of Hortense. Swamp water coloring. No visual signs of pollution.

11. 9/22/61. St. Marys River Bridge, Georgia Highway #94, at state line east of St. George. Width of river between 150 to 200 feet; stream meanders through wide river bed with flow in channel estimated at one foot per second. Water has typical swamp water characteristics. No signs of pollution. People fishing at time of observation.

12. 9/22/61. St. Marys River Bridge, U.S. Highway #1, south of Folkston. River approximately 3 feet wide; flow estimated at ½ foot per second. Water coloring typical of that of swamp water. No signs of pollution.

13. 9/29/61. St. Marys River at St. Marys. This is the tidal estuary and there was no indication of pollution along the river front.

14. 9/28/61. South Brunswick River Bridge, State Highway #303, west of Brunswick. A considerable number of fishermen fishing from bridge; also a group of fishermen observed at this point on November 10 reported good catches of speckled trout. This is the tidal estuary and water is brackish.

15. 9/29/61. Bridge of Jekyll Creek between mainland and Jekyll Island. Number of fishermen observed; good catches reported."

(6/15/62)

Village Creek in the Sea Island area; Frederica and Mackay Rivers in the St. Simons area; Back River, East River, Turtle River, and Jekyll Creek in the Brunswick area are closed to oystering since the Most Probable Number of coliform exceeds the recommended limits. Little Satilla River, Jekyll Sound, St. Andrews Sound and major portions of Cumberland Sound are open for oystering. Umbrella Creek and a portion of the upper part of the Satilla River Esturary are closed as is the estuary of St. Marys River in the vicinity of St. Marys.

POLLUTION ABATEMENT REQUIREMENTS FOR 1960

SEWERAGE

At the present time, 10 municipalities in the Basin serve only a part of their populations and 11 municipalities with populations of 800 or more have no sewage collection system. The 10 municipalities with existing systems should extend their collection systems to serve an additional 25,360 persons and the 11 municipalities should construct new collection systems to serve 14,200 persons. The total capital outlay required as shown in Table P-3 is estimated to be $1,979,000.

TREATMENT FACILITIES

The degree of treatment required at each municipality has been determined on the basis of dilution water available during periods of low stream flow and/or downstream water use. Dilution water use requirements are discussed more fully in the LOW FLOW AUGMENTATION section of this memorandum.

Existing treatment facilities at 8 municipalities and institutions are adequate for present needs. These are Fernandina Beach, the Air Traffic Center in Hilliard, Macclenny, and the Florida State Hospital in Macclenny, Baxley, Blackshear, the Glynco NAS in Brunswick, and the Industrial Park in Waycross.

There are 16 municipalities which presently do not provide treatment and should construct new treatment plants. Of this total, 6 should construct secondary treatment plants, 6 should construct stabilization ponds, and 4 should construct primary treatment plants.

There are 4 municipalities which should either make additions or enlargements to their existing treatment plants. Of these, one should add a secondary unit to its existing primary treatment plant. The total capital outlay required for needed new construction and additions to existing sewage treatment plants is estimated to be $6,372,000 as shown by Table P-3.

Industrial liquid waste disposal by 3 of the industries surveyed is adequate at present. However, the remaining 38 industries should provide more satisfactory methods of waste treatment and disposal.

AIR POLLUTION

PROBLEMS

With the exception of the coastal area and the City of Baxley, Georgia, in Appling County, the Satilla-St. Marys Basin is free from major sources of industrial air pollution. Four pulp mills located along the coast produce air contaminants which are carried long distances from the points of production. These mills are located in Appling and Glynn Counties, Georgia, and Nassau County, Florida. The contaminants generally produced contain particulate matter and mercaptans.

Among the minor sources of industrial air pollution are three sawmills and planing mills in Baxley, Georgia, a chemical plant in Brunswick, Georgia, and a seafood industry at Fernandina Beach, Florida. The Baxley mills are sources of smoke and fly ash and the other two industries are scattered throughout the Basin, but no complaints have been received concerning these sources.

There has to date been no proof of health damage in the Basin due to sources of air pollution, but property damage has occurred as the result of chemicals being released to the atmosphere. These chemicals cause damage to paint on structures and other surfaces.

No information is available on municipal or private sources of air pollution in the Georgia portion of the Basin. General information from Florida indicates that municipal air pollution problems are associated with burning garbage and trash dumps and with sewage treatment plants.

STATUS OF EXISTING PROGRAMS

Public Law 159-84th Congress and its amendments provides for "Federal technical services and financial aid to State and local government air pollution control agencies, and other public or private agencies and institutions in the formulation and execution of their air pollution abatement research programs". The Surgeon General of the Public Health Service may (1) encourage cooperative activities by State and local governments for the prevention and abatement of air pollution, (2) collect and disseminate information relating to air pollution and the prevention and abatement thereof. (3) conduct investigations and research and make surveys, and (4) prepare and publish reports and make appropriate recommendations with regard to the control of air pollution.

(6/15/62)

The Industrial Hygiene Service, Georgia Department of Public Health, has maintained records of complaints on industrial air pollution problems since 1945. Control measures used have consisted of investigation of these complaints and, where justified, discussion with the offending parties to work out a solution satisfactory to all persons concerned. During the period 1950-1959, five cases were brought to court, but none of these were in the Satilla-St. Marys Basin.

Work is underway by the Georgia Department of Public Health and the Public Health Service on a State-wide survey to locate all sources of air pollution in Georgia. The survey began January 1, 1961, and as of April 1962 a preliminary draft report of the findings had been prepared.

The Florida State Board of Health has recently completed a survey of sources of air pollution and has published "A Report on Florida's Air Resources." The 1957 Florida Air Pollution Control Act established an air pollution control commission in the State Board of Health and provided for the administrative organization to enforce air pollution control rules and regulations. The Act provides for establishment of air pollution control districts, but as yet none are operating in the SERB area. The results of the survey and the adequate enabling legislation provide a sound basis for carrying out an active and effective air pollution control program in Florida.

Both Georgia and Florida State Health Departments cooperate with the Public Health Service in the National Air Sampling Network Program. Urban sampling stations located in the SERB Area are Atlanta, Augusta, Savannah, Columbus, and Macon, Georgia. Others are operated just outside the SERB Area, but no sampling station is located within this Basin.

EXISTING NEEDS

Available data indicates the need for control of several sources of air pollution along the coastal area. Additional data on the specific pollutants and the extent of the problem are necessary before corrective action can be taken.

In the September 1959 report "Industrial Air Pollution Problems in Georgia," a need was expressed for a comprehensive study of air pollution problems in Georgia. This survey will recommend the type of legislation and programs needed and will suggest the facilities required to implement a control program in Georgia.

The September 1959 Georgia report also indicated a need for some positive research for control of the industrial air pollution problems. This need is in the following order of importance: pulp and paper industry, rendering plants, industries disseminating oxides of nitrogen

TABLE P-3
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
SATILLA-ST. MARYS BASIN

Municipality	Treatment Facilities Des'd for (1,000 PE)	Type Recommended	Estimated Costs in $1,000 Sewerage	Treatment	Total
FLORIDA					
Baldwin	2.0	secondary	64	268	332
Callahan	1.8	secondary	11	84	95
Fernandina Beach	7.5	primary	138	--	138
Hilliard	1.0	secondary	54	166	220
Macclenny	4.1	secondary	46	--	46
Yulee	0.6	secondary	30	115	145
GEORGIA					
Alma	8.5	primary	62	427	489
Baxley	5.0	secondary	56	--	56
Broxton	1.7	secondary	45	33	78
Brunswick	25.0	primary	--	1,040	1,040
Douglas	20.0	secondary	62	575	637
Folkston	1.8	secondary	90	250	340
Jekyll Island	5.0	secondary	675	230	905
Kingsland	1.5	secondary	77	31	108
Nahunta	2.3	secondary	48	41	89
Nicholls	1.2	secondary	47	27	74
Patterson	1.0	secondary	30	23	53
Pearson	1.6	secondary	41	190	231
St. Marys	3.5	primary	164	248	412
St. Simons	10.0	primary	--	154	154
Screven	1.4	secondary	50	30	80
Waycross	35.0	secondary	147	2,184	2,331
Industrial Park	3.5	secondary	--	167	167
Woodbine	1.5	primary	42	89	131
TOTALS			1,979	6,372	8,351

* Based on January 1, 1960 constant dollars.

(6/15/62)

TABLE P-4
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Type of Waste	Treatment Recommended	Est. Cost of Treatment $1,000
FLORIDA				
Duval	A	creosote	oil removal	10
	B	oils	oil removal	20
Nassau	C	pulp & paper	primary	2,160
	D	pulp mill	primary	5,000
	F	fish oil	primary	240
	H	sanitary	secondary	35
GEORGIA				
Appling	A	oils & solvents	chem precip	10
	C	creosote	oil removal	5
	B	meat pkg	city sewers	--
Bacon	F	meat pkg	stab pond	8
Brantley	H	oils & solvents	chem precip	27
	I	meat pkg	stab pond	5
	J	meat pkg	city sewers	--
Camden	R	pulp & paper	primary	3,750
	N	organic	city sewers	--
Coffee	M	poultry process	city sewers	--
	N	oils	oil removal	21
	O	oils & solvents	chem precip	5
Glynn	S	chemical	neutralization	678
	HH	chemical	primary	155
	U	organic	city sewers	--
	V	organic	city sewers	--
	Z	organic	city sewers	--
	AA	organic	city sewers	--
	BB	organic	city sewers	--
	DD	chemical	city sewers	--
	EE	pulp & paper	primary	4,320
	GG	dairy	city sewers	--
	NN	oils & solvents	chem precip	1,920
Pierce	JJ	meat pkg	stab pond	5
	KK	meat pkg	stab pond	5
Ware	LL	oils & solvents	chem precip	5
	MM	organic	city sewers	--
	NN	dairy	stab pond	6

(6/15/62)

TABLE P-4 (CONT'D)
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Type of Waste	Treatment Recommended	Est. Cost of Treatment $1,000
Ware (cont'd)	PP	laundry	city sewers	--
	SS	laundry	city sewers	--
	QQ	organic	city sewers	--
	TT	meat pkg	stab pond	32
TOTAL				18,422

* Based on January 1, 1960 constant dollars.

TABLE P-5
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
SATILLA-ST. MARYS BASIN

Municipality	1975 Treatment Recommended	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Treatment Recommended	2000 PE Untreated Waste	2000 PE Discharged Waste
FLORIDA						
Baldwin	secondary	1,500	230	secondary	2,400	360
Callahan	secondary	1,150	170	secondary	1,800	270
Fernandina Beach	primary	10,600	6,900	primary	20,000	13,000
Hilliard	secondary	2,020	300	secondary	4,200	630
Air Traffic Center	secondary	370	55	secondary	370	55
Macclenny	secondary	5,300	800	secondary	8,800	1,320
Fla State Hospital	secondary	800	120	secondary	1,000	150
Yulee	secondary	600	90	secondary	600	90
GEORGIA						
Alma	secondary	8,500	1,270	secondary	12,500	1,870
Baxley	secondary	7,670	1,150	secondary	12,750	1,910
Blackshear	secondary	2,800	420	secondary	5,000	750
Broxton	secondary	1,200	180	secondary	1,700	260
Brunswick	primary	70,000	45,500	primary	135,000	88,000
Glynco NAS	secondary	2,000	300	secondary	2,000	300
Douglas	secondary	20,000	3,000	secondary	33,000	5,000
Folkston	secondary	3,000	450	secondary	5,100	765
Hoboken	--	--	--	secondary	900	135
Homeland	secondary	800	120	secondary	1.200	180

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TABLE P-5 (cont'd)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
SATILLA-ST. MARYS BASIN

Municipality	1975 Treatment Recommended	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Treatment Recommended	2000 PE Untreated Waste	2000 PE Discharged Waste
GEORGIA (cont'd)						
Jekyll Island	secondary	5,000	750	secondary	5,000	750
Kingsland	secondary	2,500	375	secondary	3,500	530
Nahunta	secondary	2,300	350	secondary	4,500	670
Nicholls	secondary	1,200	180	secondary	2,000	300
Odum	--	--	--	secondary	800	120
Patterson	secondary	1,000	150	secondary	1,600	240
Pearson	secondary	2,600	390	secondary	4,000	600
St. Marys	primary	5,230	3,400	primary	7,960	5,170
St. Simons	primary	5,000	3,250	primary	6,500	4,230
Screven	secondary	1,400	210	secondary	1,900	295
Waycross	secondary	50,000	7,500	secondary	75,000	11,300
Industrial Park	secondary	2,000	300	secondary	3,500	525
Woodbine	primary	1,500	975	primary	2,800	1,820
TOTALS		218,040	78,885		367,380	141,595

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TABLE P-6
SOURCES OF INDUSTRIAL WASTE - 1975 AND 2000
(Excludes industries connected to municipal sewer systems)
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Treatment Recommended	1975 Vol. of Waste mgd	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Vol. of Waste mgd	2000 PE Untreated Waste	2000 PE Discharged Waste
FLORIDA								
Duval	A	oil removal	0.010	200	130	0.010	200	130
	B	oil removal	undet	500	325	undet	500	325
Nassau	C	primary	21.300	480,000	310,000	26.800	600,000	390,000
	D	primary	45.000	3,000,000	1,950,000	75.000	5,000,000	3,350,000
	F	primary	0.075	9,200	6,000	0.075	9,200	6,000
	H	secondary	0.013	500	75	0.020	750	110
GEORGIA								
Appling	A	chem precip	0.006	300	45	0.010	470	70
	C	oil removal	0.008	420	270	0.013	670	435
Bacon	F	stab pond	0.008	undet	undet	0.010	undet	undet
Brantley	H	chem precip	0.214	2,140	320	0.500	5,000	750
	I	stab pond	0.010	380	60	0.030	1,130	117
Camden	R	primary	35.000	835,000	542,800	44.500	1,000,000	650,000
Coffee	N	oil removal	0.051	--	--	0.051	--	--
	O	chem precip	0.003	140	20	0.008	400	60
Glynn	S	neutralization	21.000	--	--	35.000	--	--
	HH	primary	0.650	8,650	5,620	1.100	14,400	9,360
	CC	oil removal	0.057	860	560	0.114	1,720	1,100
	EE	primary	45.000	1,180,000	767,000	68.000	1,770,000	1,150,000
	WW	chem precip	31.600	27,000	4,000	50.800	42,500	27,600
Pierce	JJ	stab pond	0.003	365	55	0.008	920	140
	KK	stab pond	0.003	500	75	0.008	1,250	180
Ware	LL	chem precip	0.018	390	60	0.037	770	110
	NN	stab pond	0.170	600	90	0.330	1,200	180

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TABLE P-6 (CONT'D)
SOURCES OF INDUSTRIAL WASTE - 1975 AND 2000
(Excludes industries connected to municipal sewer systems)

SATILLA-ST. MARYS BASIN

Location by State and County	Code	Treatment Recommended	1975 Vol. of Waste mgd	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Vol. of Waste mgd	2000 PE Untreated Waste	2000 PE Discharged Waste
Ware (cont'd)	RR	chem precip	0.018	--	--	0.018	--	--
	TT	stab pond	0.083	8,300	1,250	0.167	16,700	2,500
	VV	oil removal	0.296	--	--	0.296	--	--
TOTALS			200.596	5,555,445	3,588,755	302.905	8,467,780	5,589,167

(6/15/62)

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TABLE P-7
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
SATILLA-ST. MARYS BASIN

Municipality	Estimated Costs in $1,000					
	1975			2000		
	Sewerage	Treatment	Total	Sewerage	Treatment	Total
FLORIDA						
Baldwin	12	--	12	45	49	94
Callahan	18	--	18	33	31	64
Fernandina Beach	170	83	253	270	478	748
Hilliard	47	102	149	109	287	396
Macclenny	132	100	232	175	415	590
GEORGIA						
Alma	119	340	459	165	458	623
Baxley	87	170	257	130	545	675
Blackshear	16	--	16	110	267	377
Broxton	15	--	15	25	--	25
Brunswick	1,130	1,398	2,528	2,925	1,729	4,654
Douglas	93	--	93	470	1,042	1,512
Folkston	60	118	178	105	178	283
Hoboken	--	--	--	45	22	67
Homeland	40	27	67	20	--	20
Jekyll Island	--	--	--	715	--	715
Kingsland	48	23	71	50	23	73
Nahunta	32	--	32	40	40	80
Nicholls	14	--	14	40	20	60
Odum	--	--	--	40	20	60
Patterson	14	--	14	30	18	48
Pearson	46	98	144	70	207	277
St. Marys	86	82	168	125	210	335
St. Simons	85	--	85	75	--	75
Screven	20	--	20	25	16	41
Waycross	453	676	1,129	1,000	1,685	2,685
Woodbine	33	45	78	65	86	151
TOTALS	2,770	3,262	6,032	6,902	7,826	14,728

* Based on January 1, 1960 constant dollars.

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TABLE P-8
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
SATILLA-ST. MARYS BASIN

Location by State and County	Code	Estimated Costs in $1,000 1975	2000
FLORIDA			
Nassau	C	2,640	1,200
	D	2,500	5,000
	H	16	17
GEORGIA			
Appling	C	--	3
Bacon	F	2	2
Brantley	H	7	28
	I	2	5
Camden	R	425	825
Glynn	S	452	910
	HH	61	72
	CC	--	7
	EE	1,580	2,950
	WW	640	1,440
Pierce	JJ	1	5
	KK	2	7
Ware	LL	3	10
	NN	3	4
	TT	14	29
TOTALS		8,348	12,514

* Based on January 1, 1960 constant dollars.

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plants and 2 municipalities will need to construct new plants to meet 2000 needs. The total capital outlay required for municipal sewage treatment facilities needed by 2000 is estimated to be $7,826,000 as shown by Table P-7.

The waste treatment facilities recommended for the 16 industries for 1975 will need to be expanded to meet 2000 needs. In addition, 2 other industries will need to expand their existing facilities or those recommended for 1960. The total capital outlay required for this expansion is estimated to be $12,514,000 as shown by Table P-8.

LOW FLOW AUGMENTATION

GENERAL

A minimum standard of water quality for fish and aquatic life is a dissolved oxygen content of not less than 4 ppm. In determining the volume of stream flow and storage required to maintain this standard, the following assumptions were used:

1. Summer water temperatures.

2. Minimum flows are 7 day low flows occurring once in 10 years.

3. Physical characteristics and reaeration constant of streams vary as to location, size, etc. of stream.

Minimum stream flows required at locations in the Basin where liquid wastes are discharged were calculated on the basis of the estimated PE for the years 1960, 1975, and 2000. At least primary treatment was assumed for all locations, and if the required dilution flow exceeded the actual low flow, secondary treatment was recommended. The minimum flows are shown in Table P-9. Locations requiring minimum flows of less than 1.0 cfs by the year 2000 are not included in the Table.

AREAS WHERE AUGMENTATION IS NOT NEEDED

There will be sufficient volumes of water available for adequate dilution, and no storage will be needed to maintain stream quality below the points of waste discharge (after recommended treatment) from the following areas: Alma, Blackshear, Kingsland, and Woodbine, Gerogia.

AREAS WHERE AUGMENTATION IS NEEDED

In several areas, the streams receiving liquid wastes travel a short distance (1 to 5 miles) before reaching a larger stream with adequate flow. This results in polluted stream conditions for short distances downstream during periods of low stream flow in the following areas: Macclenny, Florida, and Folkston, Homeland, Hoboken, and Nahunta, Georgia. Storage for augmentation of low flow or higher degree of treatment is not considered the most economical solution to these pollution problems because of the short stream distances involved. Studies of alternate solutions such as diversion will be needed in these areas.

Waste discharges to other areas in the Basin will present greater problems, however, and are discussed individually below:

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TABLE P-9
MINIMUM FLOW REQUIREMENTS
SATILLA-ST. MARYS BASIN

General Location	Receiving Stream	Water Required (cfs) 1960	1975	2000
FLORIDA				
Baldwin[2]	Cr-St. Marys River	2.1	4.7	8.3
Fernandina Beach[1,4]	Amelia River and Atlantic Ocean	34,221.6	50,397.0	81,060.0
Hilliard	ditch-L St. Marys River	0.3	0.6	1.3
Macclenny	Turkey Cr-St. Marys River	1.0	1.8	2.9
GEORGIA				
Alma[3]	Big Hurricane Cr-Satilla River	14.9	2.6	3.8
Baxley	Sweetwater Cr-Satilla River	1.6	3.4	5.5
Blackshear	Alabaha River	0.9	1.1	2.2
Brunswick[1,4]	Brunswick River and East River	13,542.5	18,239.5	27,825.5
Douglas	17-Mile Cr-Satilla River	5.1	6.0	10.0
Folkston	Spanish Cr-St. Marys River	0.5	0.9	1.5
Homeland	Spanish Cr-St. Marys River	--	0.2	0.4
	Total for area	0.5	1.1	1.9
Glynco NAS[4]	Thornhill Cr-Mackay River	7.6	7.6	7.6
Hoboken	br-Satilla River	0.4	0.7	2.1
Jekyll Island[4]	Jekyll River	7.6	19.0	19.0

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TABLE P-9 (CONT'D)
MINIMUM FLOW REQUIREMENTS
SATILLA-ST. MARYS BASIN

General Location	Receiving Stream	Water Required (cfs) 1960	1975	2000
GEORGIA (cont'd)				
Kingsland	br-Crooked River	0.5	0.8	1.1
Nahunta	br-Buffalo Cr-Satilla River	0.3	0.7	1.4
Pearson	br-Red Bluff Cr-Satilla River	0.5	0.8	1.2
St. Marys[1,4]	St. Marys River	10,850.0	12,100.0	14,515.0
St. Simons[1,4]	Dunbar Cr-Fredrica River	60.5	72.0	93.5
Waycross	ditch-Satilla River	11.8	17.8	28.1
Woodbine[1,4]	Satilla River	12.2	21.6	40.3

1 primary treatment
2 primary treatment for industry only
3 secondary treatment by 1975
4 discharge to tidewater

Tidewater Areas

Wastes from Fernandina Beach, Florida, Brunswick, Glynco NAS, St. Marys, St. Simons, and Jekyll Island, Georgia are discharged to tidewaters. Augmentation is seldom the solution to tidewater pollution. Other measures such as better dispersion of wastes by properly designed outfalls, controlled discharge to take full advantage of tidal movement, etc., are generally better solutions to tidewater pollution problems. Each area will require a detailed study to determine pollution abatement requirements. However, this memorandum has recommended primary treatment for tidewater areas except for areas near water recreation areas or those areas with existing secondary treatment facilities.

Baldwin, Florida

Wastes from this area are discharged to a small creek where there is insufficient drainage area to provide adequate dilution water or storage for augmentation during periods of low flow. As a result the creek will be polluted during periods of low flow for approximately 7 miles to its junction with the St. Marys River.

Hilliard, Florida

Wastes from Hilliard are discharged to the headwaters of the Little St. Marys River where there is insufficient drainage area to provide adequate dilution water or storage for augmentation during periods of low flow. As a result, the Little St. Marys River will be polluted during periods of low flow for approximately 12 miles to its junction with the St. Marys River.

Baxley, Georgia

Wastes from Baxley are discharged to Sweetwater Creek at a point where the natural low flow is approximately 0.6 cfs. The wastes require, after secondary treatment, stream flows of 1.6 cfs, 3.4 cfs, and 5.5 cfs in 1960, 1975, and 2000, respectively. There is insufficient drainage area on Sweetwater Creek above the point of waste discharge to provide storage for augmentation. As a result Sweetwater Creek will be polluted during periods of low flow for approximately 12 miles to its junction with Little Satilla River.

Douglas, Georgia

Wastes from Douglas are discharged to 17-Mile Creek at a point where the natural low flow is approximately 3.0 cfs. The wastes require, after secondary treatment, stream flows of 5.1 cfs, 6.0 cfs, and 10.0 cfs in 1960, 1975, and 2000, respectively. To avoid serious degradation of water quality in 17-Mile Creek storage for augmentation should be provided. The storage required on 17-Mile Creek is approximately 700, 1,000, and 2,200 acre-feet in 1960, 1975,

and 2000, respectively.

Pearson, Georgia

Wastes from Pearson are discharged to a branch of Red Bluff Creek where there is insufficient drainage area to provide adequate dilution water or storage for augmentation during periods of low flow. As a result Red Bluff Creek will be polluted for approximately 8 miles to its junction with the Satilla River.

Waycross, Georgia

Wastes from Waycross are discharged to the Satilla River at a point where the natural low flow is 9.6 cfs. The wastes require, after secondary treatment, stream flows of 11.8 cfs, 17.8 cfs, and 28.1 cfs in 1960, 1975, and 2000, respectively. To avoid degradation of the Satilla River for many miles during periods of low flow, storage for augmentation should be provided. This storage could be included in the reservior above Douglas on 17-Mile Creek. An additional 600, 1,500, and 4,000 acre-feet in 1960, 1975, and 2000, respectively in the Douglas storage reservoir would provide the necessary dilution water at Waycross.

Summary of Augmentation Needs

The areas in the Satilla-St. Marys Basin where storage for low flow augmentation is needed are shown below:

TABLE P-10
RESERVOIR STORAGE NEEDS
SATILLA-ST. MARYS BASIN

Location	Storage (acre-feet)		
	1960	1975	2000
Baldwin, Florida	insufficient drainage area		
Hilliard, Florida	insufficient drainage area		
Macclenny, Florida	not economically feasible		
Baxley, Georgia	insufficient drainage area		
Douglas, Georgia[1]	1300	2500	6200
Folkston, Georgia	not economically feasible		
Hoboken, Georgia	not economically feasible		
Homeland, Georgia	not economically feasible		
Nahunta, Georgia	not economically feasible		
Pearson, Georgia	insufficient drainage area		
Waycross, Georgia[1]	see text		

1 Storage needs given for Douglas include needs for Waycross.

ANNUAL COSTS AND BENEFITS

FINANCING

Municipalities can finance sewage works construction by general obligation bonds, revenue bonds, special assessments, or some combination of these methods. The Georgia law permits the issuance of general obligation bonds to be repaid within 30 years, up to a maximum amount of 7 percent of the evaluation of taxable property within the political sub-division. The law permits an increase of this bonded indebteness of 3 percent of the evaluation of the taxable property provided the increased indebtedness shall be repaid within a five-year period and is approved by the General Assembly.

The Florida law permits issuance of general obligation bonds up to a maximum amount of 10 percent of the evaluation of taxable property within the political sub-division. Individual exceptions to this law have been made by the legislature.

Georgia law authorizes the State to make grants to any county or municipality if funds are available to assist in pollution abatement projects that qualify for Federal aid under Public Law 660. The State grants are limited to 30 percent of that portion of the construction costs which qualify under the Federal aid program or $250,000 whichever is smaller. To date, however, no grants have been made by the State.

Financial aid is available to municipalities in the form of Federal grant assistance under Public Law 660 as amended. The Federal Government will pay up to 30 percent of the estimated reasonable cost of construction of municipal sewage treatment works or $600,000, whichever is smaller. Eligible for assistance are construction of new treatment works, improvements to existing treatment facilities, intercepting sewers, outfall sewers, pumping, and such preliminary planning necessary for construction. To date, Callahan and Macclenny, Florida and Baxley, Waycross and Blackshear, Georgia have participated in the Federal aid program constructing both interceptor sewers and/or sewage treatment plants and appurtenant works. Applications have been received and approved and Federal grant offers have been made to Douglas, Jekyll Island Authority and St. Simons, Georgia.

Industries will undoubtedly finance their pollution abatement facilities with private capital by the most economical methods available to them at the time of construction.

ANNUAL COSTS FOR 1960

The annual cost of pollution abatement by municipalities and industries in the Basin in 1960 is estimated to be $521,300. This includes the annual equivalent capital cost of existing facilities in

1960, annual replacement, and operation and maintenance cost of existing facilities. A breakdown of the total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$378,000	$3,700
Annual replacement cost	0	2,200
Annual operation and maintenance cost	133,800	3,600
Total annual cost (1960)	$511,800	$9,500

The total capital outlay required to improve existing pollution abatement facilities to meet the 1960 needs is estimated to be $8,351,000 for 24 municipalities and $18,422,000 for 23 industries. These costs are shown in Tables P-3 and P-4.

ANNUAL COSTS BY 1975

The total capital outlay required for additional pollution aabatement facilities needed by 1975 after 1960 needs have been met, is estimated to be $6,032,000 for 23 municipalities and $8,348,000 for 16 industries. These costs are shown in Tables P-7 and P-8.

The total annual cost of pollution abatement by municipalities and industries by 1975 is estimated to be $3,894,100. This includes the annual equivalent capital cost of (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet 1975 needs. The replacement cost is based on the total investment by 1975 and the operation and maintenance cost is based on existing and recommended facilities as of 1975. A breakdown of total annual costs is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$1,076,400	$1,303,600
Annual replacement cost	0	126,600
Annual operation and maintenance cost	404,800	982,700
Total annual cost (1975)	$1,481,200	$2,412,900

ANNUAL COSTS BY 2000

The total capital outlay required for additional pollution abatement facilities needed by the year 2000 is estimated to be $14,728,000 for 26 municipalities and $12,514,000 for 18 industries. These costs are shown in Tables P-7 and P-8.

The total annual cost of pollution abatement by municipalities and industries in 2000 is estimated to be $6,152,200. This includes the equivalent capital cost, the replacement cost, and the operation and maintenance cost of existing facilities and all recommended improvements for 1960, 1975, and 2000. A breakdown of total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$1,791,600	$1,911,300
Annual replacement cost	0	205,100
Annual operation and maintenance cost	652,500	1,591,700
Total annual cost (2000)	$2,444,100	$3,708,100

BENEFITS

It is recognized that pollution control results in benefits to public health and to those economic activities associated with the use of water of improved quality. However, because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from improvement in quality of water now used or anticipated to be used in the future, from public or private supplies in the Basin are indeterminate. While pollution abatement does enhance fishing and recreational opportunities, protect health, preserve and improve property and aesthetic values, and assure future utility of water resources, these values are confined largely to the intangible or social realm.

Ordinarily for those functions for which no market values are clearly established their values may in some cases be derived or estimated indirectly from prices established in the market for similar or analagous effects or may be derived from the most economical cost of producing similar effects by an alternative means. In the case of pollution abatement, however, there are no established prices for similar effects since no analagous effect exists. Neither are there alternative means of providing similar effects since, in most cases, the most likely, least cost means of attaining the desired effects is used. Therefore, lacking adequate methodology for assessing social values, benefits from pollution abatement must, for the time being, be considered as intangible. In the absence of established or synthetic market values, since the benefits from pollution abatement are real although intangible, it is considered that benefits accruing from pollution control by conventional treatment processes are at least equal to the cost of providing the facilities.

Since knowledge of society's future needs is less complete and accurate than information of present requirements, there could well be a tendency to adopt a water quality standard that is at times too high. Such has not been the case in the development of costs in this memorandum, however, because only minimum requirements or needs have been expanded into the future.

SUMMARY

1960

At the present time there are 17 municipalities (which include

3 institutions) and 41 industries which discharge wastes, treated and untreated, into the surface waters of the Satilla-St. Marys Basin.

The total volume of municipal and industrial wastes discharged to the waters of the Basin is estimated to be 158.5 mgd and the total PE 4,153,200 untreated and 4,129,200 after treatment. Industries contribute over 95 percent of the total organic load.

The existing (1960) total annual cost of pollution abatement by municipalities and industries in the Basin is estimated to be $521,300.

1975

By 1975, 29 municipalities and institutions and 35 industries are expected to discharge wastes to the surface waters of the Satilla-St. Marys Basin. The total PE of these wastes is estimated to be 5,773,400 before treatment and 3,667,700 after recommended treatment.

Reservoir storage for low flow augmentation will be needed in 2 areas in 1975. In 4 areas, receiving streams will not have sufficient drainage area to allow storage for low flow augmentation and thus polluted water conditions will exist during natural low flow periods several miles downstream. In 5 areas, the size and length of the receiving streams is such that low flow augmentation during periods of low flow would not be economically feasible and thus severely polluted conditions are expected to exist for short distances downstream.

The total annual cost of pollution abatement by municipalities and industries by 1975 is estimated to be $3,894,100. This total includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 needs.

2000

By 2000, 31 municipalities and institutions and 35 industries are expected to discharge wastes to the surface waters of the Satilla-St. Marys Basin. The total PE of these wastes is estimated to be 8,835,200 before treatment and 5,730,800 after recommended treatment.

Continued reservoir storage will be needed in 2 areas in the Basins by 2000. As in 1975, 4 areas which have insufficient drainage area to allow storage will be polluted for several miles downstream and in 5 other areas low flow augmentation will not be economically feasible and thus polluted conditions are expected to exist in localized areas.

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The total annual cost of pollution abatement by municipalities and industries by 2000 is estimated to be $6,152,200. This value includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 and 2000 needs.

PUBLIC HEALTH

INTRODUCTION

This Technical Memorandum is written with the limitation that field data were not available for all phases. Presentation of data in the subject areas of Vector Control and Solid Wastes is based upon published material and on field studies done by the Communicable Disease Center of the Public Health Service. The information is general and portions cannot be applied specifically to the Basin, but their presentation will serve as a guide to the solution of Basin problems as well as broader State and Regional problems.

VECTOR CONTROL

INTRODUCTION

Vector problems and control efforts in the Basin may be subdivided into two segments -- urban and rural. In this study, selected towns in the Basin over 1,000 population were grouped into the urban setting. Most towns which have vector control programs are primarily concerned with the control of mosquitoes and secondarily, with flies, rats, and other vectors. In the rural areas, vector problems (except for 5- to 10-mile range fresh-water flood mosquitoes) are usually solved on an individual basis. Exceptions to these are in the mosquito control work in Glynn County, Georgia, and east Nassau County, Florida. However, control efforts in these counties are centered in and around urban areas.

For long-range planning concerning land and water uses, emphasis has been given to recommendations that will result in an environment by the years 1975 and 2000 that will require only a minimum of repetitive pesticide application. This will not only minimize the cost of vector control programs to the public but will make them more effective.

EXISTING VECTOR PROBLEMS

Eastern encephalitis ("sleeping sickness") has caused serious losses among horses in the Basin. Atkinson and Glynn Counties, Georgia and Duval County, Florida reported relatively high rates of infection of this disease for two or more years during the period 1955-57. Mosquito vectors of this highly fatal human and horse disease are most prevalent in the swamps and marshes located close to and along the coast.

In recent years, primary local malaria transmission has been at extremely low levels. The number of malaria mosquitoes, Anopheles quadrimaculatus, remains about the same in the Basin as in years when malaria was prevalent. Therefore, as long as travelers bring malaria parasites back to this country from malarious areas of the earth, there will remain a danger of malaria transmission. The continuance of mosquito control efforts coupled with surveillance will still be required for many years. Freshwater pools and ponds with vegetation are favorite breeding places of malaria mosquitoes.

Typhus fever (flea-borne) was a severe problem in Florida and Georgia during the 1930's and 1940's. In recent years, improved sanitation practices (limiting the domestic rat's food and harborage) and the use of newer rat poisons and flea insecticides have reduced transmission of typhus fever to low levels. In 1959, only 8 cases of typhus were reported in Georgia. The pest control industry has played an important role in halting typhus transmission in the urban setting. Most of the remaining transmission of this disease appears to take place in rural areas.

(6/15/62)

There is considerable transmission of various enteric infections by houseflies. Determination of precise case rates is difficult because of many factors, including poor reporting difficulties of diagnosis, and patients not seeking medical help.

Rocky Mountain spotted fever occurs occasionally in Florida and Georgia. An average of 23 cases per year was reported in Georgia during the period 1955-59. Increased use and number of recreational areas and construction of outlying suburban housing areas appear to increase the possibility of American dog ticks transmitting Rocky Mountain spotted fever to humans. It is noteworthy that in the eastern United States the incidence of this disease has been highest among vacationists and picknickers, particularly among women and children.

Conjunctivitis (pink eye), a common disease of younger children, is a considerable problem in the upper half of this Basin and is confined largely to rural areas. One mode of transmission of this disease is by eye gnats (Hippelates). Oviposition of these insects occurs in freshly cultivated or otherwise disturbed soil.

The coastal area of the Basin with its extensive tidal marshlands is notorious for biting insects. Salt-marsh mosquitoes, sand flies, horse flies, and deer flies occur in large numbers and cause great annoyance to the residents and visitors in recreational areas. The salt-marsh mosquitoes are the most formidable pests of the group. At times these mosquitoes occur in such overwhelming numbers that outdoor activities during the day or night are practically impossible. Large broods of salt-marsh mosquitoes frequently occur following unusually high tides or heavy rains. It is estimated that each coastal county has about 10,000 acres of mosquito breeding salt-marsh land.

Fresh-water swamps, marshes, and low-lying areas that receive flood water are also important sources of mosquitoes. Each coastal county is estimated to have about 5,000 acres of fresh-water flood mosquito breeding land.

In the lower half of the Basin, numerous small patches of alligatorweed and water hyacinths are found in ditches and drainage creeks. Both of these obnoxious weeds were introduced into the United States from tropical areas and are spreading except in places where control work is being effected. Profuse growths of these weeds tend to clog drainage ditches, canals, ponds, etc., creating conditions favorable for malaria mosquitoes, especially in the Florida portion of the Basin. Federal programs exist which plan for the eradication of obnoxious weeds.

(6/15/62)

In urban areas, vector problems are frequently associated with improper disposal of sewage wastes. Severe Culex mosquito problems have developed in the past where communities discharge improperly treated sewage wastes into swampy or low lying areas near towns. This type of problem recently occurred in Waycross, Georgia but will soon be alleviated by the construction of new sewage treatment facilities. In about 25 percent of the towns studied, overflowing septic tanks created ideal places for the breeding of mosquitoes. A few waste stabilization ponds are beginning to appear in portions of the Basin and they could cause mosquito breeding problems unless they are properly maintained.

Fly and rat vector problems in several of the towns in the Basin are caused by inadequate storage and disposal of refuse and by the keeping of animals in towns. Most towns have open dumps for refuse disposal. About 75 percent of the towns still have large numbers of animals and poultry.

Management of water in rural areas may give rise to a variety of insect vector problems. Inadequacies of general drainage construction and maintenance contribute to mosquito breeding. Most small creeks, canals, and drainage ditches receive little or no maintenance. Some of the counties in the Basin operate one or two draglines and maintain a few men on drainage work. Generally, these drainage forces are kept constantly busy with acute immediate problems and have little time to spend on planning and constructing a master-planned countywide drainage system. Frequently, individual farmers and towns cannot construct the small mosquito control drainage ditches because of the lack of or clogging of large drainage canals in the county system.

Mosquito breeding in farm ponds in Georgia portions of the Basin has not been serious due to present construction and operating procedures. Farm ponds in Florida have considerable aquatic vegetation and thus provide a suitable environment for much mosquito breeding.

Irrigation (sprinkler type) is increasing. It is used principally during periods of dry weather for such crops as tobacco and corn, and also for pastures. No significant mosquito problems have developed from the proper application of irrigation water to fields. At one time, extensive acreages of rice were irrigated in the coastal section, and today the abandoned rice fields produce both salt-marsh and fresh-water flood mosquitoes. Such lands are used principally for cattle pasture.

Coastal artesian wells drawing from the limestone aquifer produce an alkaline water that is very favorable for the production of malaria mosquitoes. A recent study indicated that there were 28 unused wells in Camden County, 16 in Glynn, and 4 each in Charlton and Wayne Counties. However, little information is available concerning mosquito production associated with artesian wells.

(6/15/62)

Vector problems associated with land resource activities include those related to the production of livestock and poultry.

Hog parlors are beginning to appear in the Southeastern States and a few have appeared in this Basin. A common practice in these parlors is to wash waste accumulations from the concrete floors into an open septic tank with the overflow discharging to the nearest low swampy area. This method of disposal frequently causes severe housefly breeding. Only a minor fly problem was observed in a hog parlor near Waycross, where the waste material is first washed into a large underground tank, and later is pumped into a mounted tank from which it is sprayed on the fields at periodic intervals. In addition to housefly breeding, hog parlors may also have considerable rat infestations.

Chicken "factories" are also appearing in the Southeast and in this Basin. In these egg factories, the birds are usually kept in small elevated cages, beneath which cones of manure accumulate on dirt floors. Major fly and rodent problems frequently develop where there is poor housekeeping. In another type of egg and chicken factory, the chickens are kept on a deep bed of wood shavings which is removed only occasionally. Waste chicken feed from a power conveyor and water wastage plus the accumulation of manure creates a favorable breeding place for flies.

Solid waste material (principally manure) on farms appears to be increasing, and there is no practical solution for sanitary disposal without creating fly problems. The spreading of such wastes on fields at frequent intervals is very difficult due to crop growing and manpower requirements. Dairy barn liquid wastes when allowed to discharge into nearby pastures sometimes give rise to mosquito problems.

STATUS OF EXISTING PROGRAMS

There is no statewide enabling legislation for mosquito or other vector control districts in Georgia. Adequate legislation of this nature does exist in Florida.

Both Georgia and Florida have specific health regulations pertaining to the impounding of water. Permits are issued for the construction of farm ponds built under State Board of Health regulations.

Supportive services for vector control operations include:

1. Surveillance. Health agencies are concerned with a continuing analysis of vector problems to guide the efforts of other activities.

2. Research. The Florida State Board of Health has a large Entomological Research Center at Vero Beach, Florida, which is working on the control of insects affecting human health. Research on vector control is also being carried on at two Federal stations in the Southeast -- the Orlando, Florida, Laboratory of the Entomology Research Division (USDA) and the Technical Development Laboratories of the Communicable Disease Center (USPHS), Savannah, Georgia. In Pensacola, which is outside the Satilla-St. Marys Basin, the Public Health Service, in cooperation with the involved State and local health departments, is attempting to eradicate the yellow fever mosquito, Aedes aegypti. Now in its third year of operation, the project is making excellent progress toward the eradication goal. Public education, environmental sanitation, and DDT residual premises spraying methods are being utilized.

3. Technical assistance. Health agencies provide technical assistance to the construction and operating agencies in planning and carrying out vector control operations. Local sanitarians give technical advice and assistance to local communities and to individuals.

Present vector control programs in the Basin consist of one mosquito control district, one countywide mosquito control program, and several municipal mosquito control programs. The Amelia Island Mosquito Control District is a new district on the eastern edge of Nassau County, Florida. The District's present budget consists of about $71,000 a year of which $37,000 is local funds and $34,000 comes from the Florida State Board of Health. The District operates one 3/4 yard dragline together with ground larviciding and adulticiding chemical application units. It is expected that about 3,000 acres of salt-marsh and fresh-water mosquito breeding areas will be ditched in the next few years. These ditches will be for the management of water in the upper portions of the marshes. Over 95 percent of the salt marshes on this island are covered daily by tides and do not breed salt-marsh mosquitoes. Present knowledge indicates that the construction of upland water management ditches enhances fish propagation and has little or no deleterious effect on duck hunting. Ditches are usually a minimum of 8 to 9 feet wide and at least two feet deeper than mean low water. Since small motor boats can be operated in the ditches, duck hunters like them because of easier access to suitable duck shooting locations. Care is taken not to drain large permanent bodies of water in the marshes which encourage duck populations and which do not breed salt-marsh mosquitoes or sand flies.

The Amelia Island District also plans to construct impoundments, if favorable locations are found, to use for a permanent control method that reduces both sand fly breeding and mosquito production. Mosquito control impoundments favor the maintenance of larger duck populations.

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A mosquito district in Glynn County, Georgia, has been considered by local officials for a number of years and is badly needed. A total of about $29,000 a year is now being spent county-wide on mosquito control. Measures utilized include hand ditching in small fresh-water breeding places and the operation of a fogging machine. The program needs to be expanded to include permanent control measures, expansion of larviciding and adulticiding measures, and the employment of trained professional mosquito control workers. Fog machines are employed on Sea Island and St. Simons Island, Georgia, but permanent control measures are needed. Jekyll Island State Park has experienced severe problems with mosquitoes, biting flies, and ticks but as yet, does not have a vector control program.

Several towns in the Satilla-St. Marys Basin have small programs for the control of mosquitoes and other vectors (see Table PH-1). These programs need more adequate financing, more permanent control measures, and better technical supervision.

There are very few vector control programs in the rural areas of the Basin except that most of the county health departments provide free rat poison upon request together with technical advice and assistance.

EXISTING NEEDS

There is a need for more emphasis on mosquito larviciding and permanent control measures. Each county needs at least one dragline for mosquito work. Towns in the district should have from one to several year-round mosquito control workers who would inspect for larvae during the mosquito season, apply larvicides to mosquito breeding areas, operate adulticiding machines occasionally when large mosquito infestations occur, and do maintenance and minor ditch construction during winter months.

Legislative and regulatory needs include:

1. State enabling legislation permitting the establishment of tax-supported vector control districts in any county of Georgia;

2. Regulations to require the control of wasteful flow from artesian wells.

Needs pertaining to surveillance and technical assistance include:

1. Extensive surveys of vector disease occurrence and vector problems.

2. Increased training of local health department personnel in vector control intelligence.

3. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and related land resource developments.

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Some of the major research needs include:

1. Development of better permanent control techniques in salt-marshes that will control mosquitoes, sand flies, and other vectors and at the same time be beneficial to other interests, such as wildlife conservation.

2. Development of better equipment and methods for constructing and maintaining water management ditches.

3. Development of new agricultural and industrial uses for idle coastal land.

4. Improved methods for the sanitary handling of manure and other wastes on livestock and poultry farms including the possible use of stabilization ponds for disposal of wastes and for irrigation and fertilization.

5. Improved design for catch basins so that they do not hold water.

6. Development of new or modified chemical formulations which would overcome insecticide resistance problems and present less danger to water supplies.

7. Development of improved equipment and application techniques for chemical control of vectors in urban areas.

Vector control program needs include:

1. Establishment of mosquito control districts in the remainder of Nassau County, Florida, and in Camden and Glynn Counties, Georgia. Each district would need from 2 to 3 draglines for permanent control work.

2. The development of countywide water management systems and programs.

3. Increased use of sanitary landfills both in towns and in counties. Many lowlands exist in the Basin that could be filled profitably using the sanitary landfill method.

4. Increased implementation of Federal programs by State and local interests to eradicate infestations of alligatorweed, water hyacinths, and other obnoxious weeds.

An unsolved problem in Georgia concerns the financial support of mosquito abatement districts by counties with small populations. The future solution to this problem would appear to be financial assistance by the State of Georgia. Such State aid to organized mosquito control agencies in Florida has proven very successful. State aid in Florida includes funds, supplies, services, and equipment.

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In order that vector control programs will be compatible with multipurpose functions, it is essential that there be coordination between all interests concerned.

POTENTIAL PROBLEMS AND SOLUTIONS

Based on present knowledge, the one vector problem that appears to be on the rise and could be a significant one in the Basin is mosquito-borne encephalitis -- both the Eastern and St. Louis strains. Eastern encephalitis has caused serious losses among horses in the Basin. Sooner or later it could cause epidemics among man, as was true in Jew Jersey in 1959 (this constituted New Jersey's first confirmed human cases, even though it had killed horses there for at least 50 years). The Eastern disease occurs principally in areas with vast fresh-water swamps and salt marshes (Coastal Plain).

St. Louis encephalitis -- a human disease -- is not known to have occurred in the Basin, but it has recently been reported in Pinellas County, Florida. This disease presents a threat to communities that allow uncontrolled production of Culex mosquitoes.

On the basis of current knowledge concerning mosquito-borne encephalitis, the only feasible approach to control of the disease is a program of prevention -- mosquito control for the community, or population groups, and protection against mosquito bites for the individual.

Increases in transmission of enteric infections by houseflies could increase due to changes in agricultural practices and further "suburbia" developments.

COSTS AND BENEFITS

The principal benefit of any well organized vector control program is to provide adequate safeguards to public health. This includes freedom of disease and infirmity which is difficult to evaluate in dollars. Recent research studies have shown that permanent brain and motor damage, especially in small children, frequently results from cases of mosquito-borne encephalitis. The prevention of just one death or case of permanent damage would amply justify the amount of money proposed for vector control work in any one of the towns or counties in this Basin.

Another benefit of vector control programs would be acceleration of development and use of waterfront land. It is common knowledge that excessive numbers of salt-marsh mosquitoes, sandflies, dog flies, and other vectors on such land are an impediment to industrial plants, subdivision developments, and recreational areas.

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Another benefit would be to provide economic safeguards, particularly with reference to tourism or resort areas. This is exemplified by the 1959 outbreak of Eastern encephalitis in Jew Jersey. Although this outbreak involved only 33 human cases with 21 deaths during a 2-month period, it was estimated that the episode caused a loss to Atlantic City hotels of $2,000,000.

The estimated cost of needed vector control programs are included in Table PH-1. Studies in the Chatham County, Georgia area have shown that the total cost of the mosquito control program is being substantially balanced by reduced costs to families in the purchase of household sprays, aerosol bombs, and repellents. A small-scale study in Brunswick, Georgia, indicates that this would be true in Glynn County also.

(6/15/62)

TABLE PH-1
VECTOR PROBLEMS AND PROGRAMS
SATILLA-ST. MARYS BASIN

City or County 1960 Population	Vector Problem Degree 1	 2	 3	Approximate Annual Cost of Vector Control Program* Present	 Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
FLORIDA									
Amelia Island Florida Mosquito Control District Nassau Co. (east)				$71,000	$71,000				
Baldwin 1,272		F	M R T	None	6,000	Open dump	Light	Light	
Fernandina Beach 7,276		M F	R T	See Amelia Island		Open Dump	Moderate	Light	
Nassau County (west)				none	29,000				
GEORGIA									
Alma 3,515		M F	R T	2,000	5,000	Open dump	Moderate	Light	
Baxley 4,268		F	M R T	3,000	6,000	Remote open dump	Moderate	Light	

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TABLE PH-1 (CONT'D)

City or County 1960 Population	Vector Problem Degree 1	 2	 3	Approximate Annual Cost of Vector Control Program* Present	 Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
GEORGIA - Cont'd									
Blackshear 2,482		M F	R T	$ 5,000	$10,000	Open dump	Light	Light	Planning a landfill
Brunswick 21,703	M	F T	R	See Lynnn County		Modified sanitary landfill	Moderate	Light	
Camden County				None	30,000				
Douglas 8,736		M F	R T	11,000	11,000	Open dump	Moderate	Light	
Folkston 1,810			M F R T	None	5,000	Open dump	Moderate	Light	
Glynn County				29,000	100,000				
Jekyll Island State Park				None	15,000	Incinerator			
Kingsland 1,536	F M	R	T	None	10,000	Open dump	Severe	Severe	Many overflowing septic tanks
Pearson 1,615		M F R	T	None	5,000	Open dump	Moderate	Moderate	
Waycross 20,944		M F	R T	1,000	40,000	Modified sanitary landfill	Severe	Moderate	Roaches in sewers is big problem

M - Mosquitoes
F - Flies
R - Rats
T - Ticks

1 - Severe
2 - Moderate
3 - Light

*Costs of refuse collection and disposal are not included in this table.

Fifteen of these industries could connect to nearby municipal sewer systems. Primary treatment should be provided by 6 of the industries and one should provide secondary treatment. Stabilization ponds should be provided by 6 of the industries and 4 industries should provide oil removal. The remaining 6 industries should provide either chemical precipitation or neutralization. The total capital outlay required for industrial pollution abatement facilities in 1960 is estimated to be $18,422,000 as shown in Table P-4.

OTHER NEEDS

A need exists in the Satilla-St. Marys Basin and other areas of the Southeast River Basins to determine the effects of pollution from insecticides, pesticides and herbicides and methods for their controlled application.

As stated in the EFFECTS ON STREAMS section, there are very little data available on surface water quality in the Basin. There is a need to collect more information on water quality especially as it is affected by waste discharges and river developments. There is a particular need to study waste treatment and disposal in the larger urban areas of the Basin such as Brunswick and Waycross, Georgia and also in the large industrial areas in the Coastal counties of Nassau, Florida and Camden and Glynn, Georgia. The intermittent nature of many of the receiving streams, the interflow between surface and ground waters, which is prevalent in the Lower Coastal Plain Province, coupled with the growth and attendant increases in water use and waste discharges will greatly affect water quality within the Basin. The determination of these and other factors affecting water quality will require additional study.

FUTURE POLLUTION ABATEMENT REQUIREMENTS

PROJECTIONS

By 1975, there are 29 municipalities and institutions expected to have sewage works. As shown by Table P-5, the total PE of the sewage before treatment will be 218,000 and the PE after recommended treatment is estimated to be 78,900.

By the year 2000, 31 municipalities and institutions are expected to have sewage works. As shown by Table P-5, the total PE of the sewage before treatment will be 367,400 and the estimated PE after recommended treatment will be 141,600.

As shown by Table P-6, industrial wastes discharged by 35 industries will have a total PE before treatment of 5,555,400 and 8,467,800 by 1975 and 2000, respectively. These wastes will have an estimated total PE after recommended treatment of 3,588,800 and 5,589,200 by 1975 and 2000, respectively. These figures do not include 5 industries for which waste discharges are either undetermined or of an inorganic nature. It is assumed that all other industries

in the Basin will discharge wastes to subsurface systems, evaporation ponds or to municipal sewerage systems.

SEWERAGE

Assuming that sewerage requirements for 1960 will have been met, additional sewerage construction will be required in 23 municipalities by 1975. These 23 municipalities will require extension of the sewage collection systems required for 1960 to serve an additional 55,400 persons. As shown by Table P-7, the total capital outlay required for extension of sewerage systems is estimated to be $2,770,000 to meet 1975 needs.

By the year 2000, there will be a need for sewerage construction in 26 municipalities. These municipalities will require extension of the sewage collection systems recommended in 1960 and 1975 to serve an additional 138,000 persons. As shown by Table P-7, the total outlay required for extension of the sewage collection systems required to meet the needs by the year 2000 is estimated to be $6,902,000.

TREATMENT FACILITIES

The degree of treatment required at each municipality, institution, and industry has been determined on the basis of dilution water available during periods of low flow and/or downstream water use. In the upstream areas where low flows are not sufficient to protect water quality after secondary treatment, low flow augmentation is recommended. However, primary treatment only has been recommended for wastes discharged to tidewater. These areas are discussed more fully in the LOW FLOW AUGMENTATION section of this memorandum.

The sewage treatment facilities recommended for 1960 will be adequate to meet the 1975 needs in 13 municipalities and institutions. Twelve other municipalities, however, will need to enlarge either their existing treatment facilities or those recommended for 1960 to meet 1975 needs. One municipality will need to construct a new stabilization pond. Of the 12 plant enlargements recommended, 4 are for primary plants, 6 for secondary plants, one for stabilization ponds, and one to add a secondary unit to an existing primary plant. The total capital outlay required for municipal sewage treatment plant construction by 1975 is estimated to be $3,262,000 as shown by Table P-7.

Existing treatment facilities or those recommended for 1960 will be adequate to meet 1975 needs for 8 industries. However, 16 industries will need additional waste treatment facilities by 1975. The total capital outlay required for this construction is estimated to be $8,348,000 as shown by Table P-8.

Sewage treatment facilities recommended for 11 municipalities for 1975 will need to be enlarged to meet 2000 needs. In addition, 9 municipalities will need to enlarge their existing or recommended 1960

and sulfur, and the kaolin, talc, slate and fuller's earth industry.

It is noted that most of the available data on air pollution is for industrial sources. Corrective measures should be determined and put in force for municipal, commercial, and individual air polluters also.

POTENTIAL PROBLEMS AND SOLUTIONS

Expansion of present industry along the coastal area is expected to intensify existing air pollution problems. Closer control on water pollution will open up areas for expansion of seafood industries which in turn must be regulated to prevent air pollution. The paper, pulp, and wood products industries at present and in the future are expected to be the major source of air pollution in the Basin. Measures should be considered for correcting air pollution from municipal, commercial, and private sources. This would call for meterological studies as an aid to zoning and planning functions, the preparation of air quality guides, and eventually the establishment of air pollution emission criteria for logical air basins.

Research has produced methods and devices that will eliminate gases, smoke, and particulate matter from the atmosphere. New industry should be required to install air pollution abatement devices and measures should be adopted now to control present polluters of the atmosphere.

Recommendations in "Florida's Air Resources" point out the solution to their State's air pollution problems as:

1. Adoption of legislation to permit and foster establishment and operation of county and multi-county air pollution control programs throughout the State.

2. Review and approval of plans for construction and alteration of establishments which may cause air pollution.

3. Enabling legislation to permit county-wide zoning.

4. Adequate staffing and financing to carry out a program of surveillance, control, assistance, and research in air pollution.

COST AND BENEFITS

The cost of control of air pollution cannot be evaluated since specific quantity and quality information is not available for the sources.

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Benefits to be derived from air pollution abatement result in reduction in nuisances, effects on public health, and decrease in maintenance costs of buildings and of personal property. Benefits are considered to be equal to costs of air pollution control.

RADIOLOGICAL HEALTH

PROBLEMS

The radiological health problem is best determined by considering all of the following sources of radiation: air, water, milk and food, and local sources such as medical and environment. The total effect of these sources is not known for the Satilla-St. Marys Basin.

There are no nuclear reactors in this Basin, but the Atomic Energy Commission has licensed two industries and one hospital to use radioactive isotopes. One nursery in Nassau County, Florida, used radioisotopes in 1958, but data are not available as to the present status of use.

Data collected by State and Federal agencies on the radiological quality of the Basin's waters are shown in Table PH-2. The results of weekly composite samples of surface water collected by the Public Health Service for the U. S. Study Commission, SERB is included.

STATUS OF EXISTING PROGRAMS

The Florida State Board of Health collected 3500 water samples for radiological analysis during the period March 1958 to October 1960. The sampling program includes surface and ground water sources with permanent sampling stations on each watershed in the State. Progress Report No. 4 - "Radiological Surveillance Program, March 1958 through October 1960"summarizes radioactivity in water as follows:

1. "A marked decrease in the radioactivity of surface waters and rainfall became apparent in the late spring of 1959 and continued until the French weapons testing the latter part of February 1960. The activity from this testing dropped off by May 1960 and continues to be undetectable.

2. An increase in the activity of underground water has not been found.

3. A few areas in the State, principally the phosphate ore bearing regions, have shown a little more alpha activity in both surface and underground waters than other portions of the state. This activity is negligible and much below maximum permissible levels."

(6/15/62)

TABLE PH-2
RADIOACTIVITY IN WATER
SATILLA-ST. MARYS BASIN

Sampling Station	Period of Analysis	No. of Analyses	Gross Alpha (uuc/l) Avg.	Max.	Min.	Gross Beta (uuc/l) Avg.	Max.	Min.	Remarks
Florida Surface Waters									
St. Marys River - Georgia Line N. W. Macclenny	1959-60	2	0.3(1)			134.5	248.9	20.0	
Container Corp. of America Pond - Nassau County	1960	4	3.9(2)	4.5	3.3	5.4	11.2	0.9	
Drainage Ditch - Hilliard Highway 301	1960	1	0.4			6.8			Partly Spring fed
Florida Ground Waters									
Hilliard Municipal Well	1960	1				17.4			Deep well, 900' finished water
Macclenny Well	1959	1				1.3			Deep well
Macclenny Tap Water	1960	1	1.1			1.1			Finished water
Fort Clinch, Jetty Lodge	1959	1	0.1			6.5			
Fort Clinch, Picnic Area	1959	1				2.1			
R. N. Youngs' Inc.	1959	1	0.5			27.0			Shallow Well

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TABLE PH-2 (CONT'D)
RADIOACTIVITY IN WATER
SATILLA-ST. MARYS BASIN

Sampling Station	Period of Analysis	No. of Analyses	Gross Alpha (uuc/l)			Gross Beta (uuc/l)			Remarks
			Avg.	Max.	Min.	Avg.	Max.	Min.	
Georgia Surface Waters									
Little Satilla River near Offerman	1960-61	3	2.0	4.5	0.0	3.1	5.2	2.0	Weekly composites collected by PHS for the USSC
Satilla River, near Waycross	1960-61	3	2.8	6.9	0.0	5.7	12.0	2.0	Weekly composites collected by PHS for the USSC
Satilla River, at Atkinson	1960-61	3	2.1	4.8	0.0	5.2	9.9	2.0	Weekly composites collected by PHS for the USSC

Note: Number in parenthesis shows number of analyses upon which the average was computed if different from total number of analyses.

There are no Federal, State, or local radiological health program activities operating in the Georgia portion of the Basin. The Georgia Department of Public Health plans a surface water monitoring program to gather data on background radioactivity in their streams.

Other activities of the States include maintaining a list of Atomic Energy Commission licensed isotope users. Florida surveys sites for industrial users.

EXISTING NEEDS

The air phase of surveillance has never been undertaken by the States due to lack of funds, personnel, and equipment. Development of this phase of the program is increasingly important.

There is a need for control of radiological health hazards associated with the use and disposal of radioisotopes in the Basin.

Georgia needs additional funds and personnel to enable it to expand water and air monitoring programs in order to establish a State-wide radiation background picture for future use. Assistance is also needed in a surveillance program for radioactive contamination of milk and food supplies.

POTENTIAL PROBLEMS AND SOLUTIONS

It is expected that the use of radioisotopes will increase in the future. Control of their use is a State responsibility. Funds and personnel should be made available that will permit the States to have a balanced and effective program.

Solutions to these problems include the following:

1. Enactment of specific State legislation to control radioactive pollutants and license radioisotope users.

2. Provision of additional funds and personnel for State-wide programs of control and monitoring of air, water, milk and food.

SOLID WASTES

INTRODUCTION

Most communities collect and dispose of solid wastes as a governmental service, financing the operation by general taxation or by a special service charge. In a few instances, the collection

and disposal is left to the individuals producing the waste or to private collectors who charge a fee for the service.

Methods of disposal vary, including dumping (and burning) on the surface, placing in sanitary landfills, and incineration. The annual amount of waste produced on a national average is 0.8 to 1.0 cubic yard or about 650 pounds per person per year (approximately 2 pounds per person per day).

Incineration is considered as one of the best methods of disposal but only one of the communities in the Basin is using this method. Incineration of waste is not economical for small communities since it usually requires a population of 50,000 or more to support an efficient operation.

Sanitary landfills are the best method of waste disposal for any small community having suitable land available within reasonable hauling distance and they can be used at a cost which is not prohibitive. They are an effective and proven method, accepted by the State departments of health.

PROBLEMS

Open dumps with the burning of some garbage and combustible material are the most common method of solid waste disposal used by small communities in the Basin. This is not an acceptable method because unburned garbage and refuse become breeding places for insects and rodents, and smoke and odor problems develop. Costs, ignoring benefits, for dump operations are approximately 50 percent of that for sanitary landfills.

STATUS OF EXISTING PROGRAMS

State and local health departments have adequate authority to control the proper storage, collection, and disposal of solid wastes. At present only three communities in the Satilla-St. Marys Basin have a system of solid waste disposal which approaches health department requirements. Waycross and Brunswick, Georgia, use modified sanitary landfills and Jekyll Island, Georgia, has a newly constructed incinerator. Although detailed survey information is not available, it is believed from what information is available that the remainder of the towns in the Basin have open dumps. One city is planning to begin a sanitary landfill.

EXISTING NEEDS

An estimated 20 municipalities (having a 1960 population of 500 or more) with a total population of approximately 45,000 need sanitary landfills in 1960. In communities of under 500 population, good

housekeeping practices can be carried out by the individual. Most communities will need to adopt regulations to enable them to cope with solid waste disposal problems.

POTENTIAL PROBLEMS AND SOLUTIONS

Large urban areas find that the use of incinerators is more practicable than sanitary landfills when land is not available at reasonable cost. By 1975, there will be an estimated 25 sanitary landfill programs in operation which will serve approximately 147,700 persons. By 2000, Brunswick, Georgia will need an incinerator to serve approximately 102,800 persons. In addition there will be 26 sanitary landfill programs in 2000 which will serve 169,300 persons.

Land requirements for communities operating sanitary landfills are based on a need of one acre per 10,000 population per year. These requirements for the period 1960-2000 are shown in Table PH-3.

TABLE PH-3
LAND REQUIREMENTS FOR SANITARY LANDFILLS
SATILLA-ST. MARYS BASIN

Period of Time	Number of Communities	Avg. Population to be served	Acres Required
1960-1964	25	80,800	25*
1965-1974	25	129,200	130
1975-2000	26	158,500	395
Total			550

*Does not include land requirements for modified landfills.
Note: Brunswick, Georgia, will be served by an incinerator in 2000.

COSTS AND BENEFITS

Present costs for construction of incinerators ranges from $2000 to $4000 per ton daily capacity. Operational costs vary considerably with the City of Atlanta reporting $1.48 per ton for the year 1959, and $1.27 per ton for 1960. Other cities report costs two to three times this amount.

Costs of operation of sanitary landfills average $0.50 to $1.00 per ton of refuse handled. Cities as large as Los Angeles, California, and New York City use this method of disposal. New

York City's experience has shown that disposal by sanitary landfills costs approximately half that of incineration.

Cost of operation of a solid refuse program including collection and disposal will vary with each community but will, depending on the size of the community, range from $1.00 to $4.50 per person per year. Based on a scaled cost, annual costs for a solid refuse program in the Satilla-St. Marys Basin are shown on Table PH-4.

TABLE PH-4
SOLID WASTES PROGRAM ANNUAL COSTS
SATILLA-ST. MARYS BASIN

Type of Operation	1960	1965	1975	2000
Incineration				
Capital Costs	$ 500	--	--	$20,400
Operation and Maintenance	5,000	$5,000	$5,000	110,000
Replacement	200	--	--	6,900
Sanitary Landfills				
Collection and Disposal	76,200	277,400	320,000	398,700
Totals	$81,900	$282,400	$325,000	$536,000

The capital investment for incinerators is estimated to be $10,000 in 1960, and $420,000 in the year 2000. Operation and maintenance annual costs for the incinerator program are based on $1.00 per person served. The total cost for the sanitary landfill program is considered to be all operation and maintenance. All operation and maintenance costs include collection as well as disposal of the solid refuse.

SUMMARY AND CONCLUSIONS

SUMMARY

Insect-borne diseases do not now constitute a major health problem in the Basin. The following diseases, however, do present a continuous threat: encephalitis, malaria, typhus fever, and Rocky Mountain spotted fever. The most serious insect problems are the sal -marsh mosquitoes and sand flies in the seashore counties.

Important vector problems due to man's activities include those associated with the disposal of sewage, the storage and disposal of refuse, water-holding catch basins, uncontrolled flow from artesian wells, the disposal of dredge spoil, and the accumulation and disposal of manure on farms.

There is no statewide enabling legislation for vector control districts in Georgia, but adequate legislation of this nature does exist in Florida.

Present vector control programs consist of one mosquito control district (Amelia Island in east Nassau County, Florida), one countywide mosquito control program (Glynn County, Georgia), and several municipal mosquito control programs.

Major industrial sources of air pollution occur along the coastal area, and minor industrial sources occur in the small inland cities of the Basin. Studies have been completed to determine all sources of air pollution in Georgia and Florida.

Two industries, one hospital and in the past one nursery have been licensed by AEC to use radioisotopes. Air, water, and other monitoring programs are underway in Florida and to a lesser degree in Georgia. No problem areas have been found as a result of these limited monitoring activities.

Solid wastes are not handled entirely satisfactorily by any city in the Basin. However, the cities of Waycross and Brunswick, Georgia, and Jekyll Island State Park do have fairly good operating programs. Another 20 cities need sanitary landfills immediately and only one of these has definite plans to start a program.

CONCLUSIONS

Control measures and supportive services needed to reduce public health problems associated with insect and rodent vectors are:

1. State enabling legislation permitting the establishment of tax-supported vector control districts in any county of Georgia.

2. Regulations requiring the control of wasteful flow from abandoned artesian wells.

3. More extensive surveys of vector disease occurrence and vector problems.

(6/15/62)

4. Increased training of local health department personnel in vector control intelligence.

5. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and land resource developments.

6. Development of better permanent control techniques in salt-marshes to serve multi-interests.

7. Development of better equipment and methods for constructing and maintaining water management ditches.

8. Establishment of mosquito control districts in the remainder of Nassau County, Florida, and in Camden and Glynn Counties, Georgia.

9. Development of countywide water management systems and programs.

10. Improved design for catch basins so that they do not hold water.

11. Increased use of sanitary landfills in towns and in counties, and use of countywide refuse collection systems.

12. Increased use of sewers and central treatment plants in lieu of septic tanks in new subdivisions.

13. Development of improved methods for the sanitary handling of manure and other wastes on livestock and poultry farms.

14. Greater consideration of mosquito prevention and control measures in connection with future spoil dredging activities.

15. Implementation of a program for the control and progressive eradication of alligatorweed, water hyacinths, and other obnoxious weeds in the Basin.

16. Initiation of a state-aid financial program in Georgia for vector control work.

17. Better coordination between agencies so that vector control programs are compatible with multi-purpose functions.

18. Establishment of countywide rodent control programs where none exist.

19. Development of effective techniques for the control of eye gnats, and improved methods for control of dog flies.

Based on present knowledge, a vector problem that appears to be on the rise and could be a significant one in the Basin by 1975 or 2000 is mosquito-borne encephalitis. At present the only feasible approach to control of encephalitis is a program of prevention--mosquito control for the community (or population groups) and protection against mosquito bites for the individual.

The Statewide air pollution surveys recently completed by Florida and Georgia should be utilized as a basis for planning future control programs. Study and research should be undertaken immediately to determine the feasibility and desirability of controlling air pollution from the processing of pulp and the manufacturing of wood product materials. Since the economy of controlling this particular source of air pollution is closely related with the control of water pollution from this industry, the two programs should be coordinated. Air pollution control measures in the large urban areas of the Basin should be strengthened.

Funds are needed for the expansion of the radiological monitoring program in Georgia and to a lesser degree in Florida. This surveillance program on water, air, milk and food, and related items is essential in this nuclear age.

Solid wastes programs should be started immediately in twenty Georgia and Florida cities in the Basin. Funds for such a program ($1.00-$2.50 annually per person) could be obtained through a local taxation. Estimated annual costs of providing adequate refuse collection and disposal programs for 1965, 1975, and 2000 are $282,400, $325,000, and $536,000 respectively. This includes the cost of an incinerator program for Jekyll Island during the entire period and for Brunswick, Georgia, in 2000.

APPENDICES AND BIBLIOGRAPHY

APPENDIX
DEFINITIONS AND ABBREVIATIONS

1. cfs - cubic feet per second.
2. Garbage - putrescible animal and vegetable wastes resulting from the handling, preparation and consumption of foods.
3. gpcd - gallons per capita per day.
4. gpd - gallons per day.
5. mg - million gallons.
6. mgd - million gallons per day.
7. PE - population equivalent.
8. ppm - parts per million by weight.
9. Pollution, water - the addition of sewage, industrial wastes, or other harmful or objectionable material to water.
10. Quality, water - is defined as the expression of water characteristics in terms of its physical, chemical, bacteriological, biological, and radioactive content.
11. Resources, water - is defined as the water available to serve mankind and his civilization for the varied, complex, and often conflicting beneficial uses. These uses include sources for municipal and domestic supplies, agriculture, industrial development, and for recreation, propagation of aquatic life and other forms of wildlife, navigation and ultimate waste disposal.
12. Supplies, domestic water - are those supplies used for individual families, including those also serving tenant families living on the property. Domestic supplies do not include commercial establishments, schools, churches, or camps.
13. Supplies, industrial water - are considered as industrially owned supplies, primarily developed for process or cooling purposes but which might be incidentally used for sanitary purposes.
14. Supplies, municipal water - are public supplies serving a municipality or communities of 50 or more people.
15. Supplies, semi-public water - are supplies for schools, motels, camps, and other supplies serving water to the public; or commercial establishments not classed as municipal or industrial.
16. Wastes, municipal - include all liquid wastes received by community sewers.
17. Wastes, industrial - the liquid wastes from industrial processes as distinct from domestic or sanitary sewage.
18. Wastes, solid (or Refuse) - includes all wastes of a solid nature not otherwise disposed of to the sewers or to the atmosphere. This includes all putrescible and nonputrescible solid wastes such as garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles, and solid market and industrial wastes.
19. Wastes stabilization ponds - a properly engineered and operated pond for the biological reduction of organic wastes.

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20. Water supply systems - includes the works and auxiliaries for collection, treatment and distribution of the water from the source of supply to the free-flowing outlet of the ultimate consumer.

Note: For the definition of any other terms which are used in this memoranda, refer to Glossary of Water and Sewage Control Engineering, 1949, American Society of Civil Engineers.

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